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This Week in The IRON AGE

Vol. 153, No. 16 April 20, 1944

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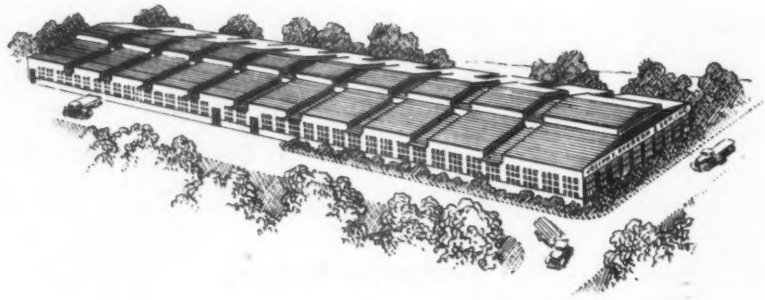

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The IRON AGE

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April 20, 1944

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Strange Words; Queer Bedfellows

ONE of the advantages (or is it?) of being an engineer is that the words you use in your business have definite and well understood meanings. Thus when you speak of the cosine of an angle, or of an SAE steel of a certain number or of so many kilowatts per hour, the people who talk the same language know exactly what you mean.

The disadvantage, if any, of such exact expression of thought is that you cannot do much finagling with it. You have to know what you mean when you say it, and you cannot twist the meaning later to mean something quite different.

In spite of this disadvantage and the burden it would impose of thinking twice or perhaps three times before speaking, I think it would be of great public benefit if statesmen and politicians were compelled to define clearly the terms that they use. As it is now, we are obliged to define them chiefly by knowing who says them and even then they don't stay put.

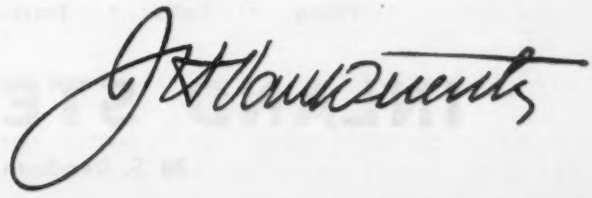
Take, for example, the terms "isolationist," "nationalist" and "internationalist." The common acceptance of an isolationist has become that of any guy who doesn't like the New Deal and has guts enough to say so. But as a matter of fact, the chief New Dealer was himself a professed isolationist when he was re-elected for a third term on the promise to keep us out of war and that no American soldier would be called upon to fight on foreign soil.

Skipping the term "nationalist" for the moment, because we don't hear much about it now in this country, let's discuss that puzzling noun "internationalist." If you know what it means, you are indeed a better man than I, for I do not. I don't know whether an internationalist is one who puts the interests and welfare of all men and all nations on a par or whether he has mental reservations concerning enemy nations and so-called neutrals. And sometimes I am led to believe that an American internationalist is a person who favors the welfare of some other country more than he does his own. At least that's the impression that some of our leading American internationalists give me.

And now for that forgotten American, the nationalist. A nationalist is not an isolationist. Mr. Churchill is no isolationist but he stamped himself indelibly as a nationalist when he said that he would not preside over the obsequies of the British Empire. Mr. Stalin is a nationalist of the first order in that regardless of what his allies or his enemies do or do not do, he is for the survival and the welfare of the U.S.S.R., first, last and always, which is as it should be.

Nationalism does not mean that you do not wish to give your neighbors a helping hand when they need it, and if you can afford it. It simply means putting first things first, your own country included.

Internationalism as it is preached in America is an expensive practice which invokes opening the safe to all comers. Only a rich nation can afford it and then not for long. Mr. Willkie's sad experience in Wisconsin is an indication that Americans are getting fed up with it.



Inland Freighters Plow Through Ice To Deliver Materials of Victory

The Inland fleet began plowing its way through ice in late March to deliver materials of Victory to the great Indiana Harbor mills.

The shipping season was opened several days earlier than usual this year—because the winter was generally mild at the head of Lake Michigan, and because it was necessary to begin delivering as early as possible the millions of tons of high grade ore, pure limestone, and coking coal needed by the mills for the production of steel for war.

The Inland freighters, like every other unit in the Inland organization, are doing their best to bring Victory as quickly as possible, so that we can begin filling the peacetime needs of America.

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The IRON AGE
APRIL 20 1944

NEWS FRONT

► Now that the Ordnance Department has released a mass of publicity explaining its return to brass cartridge cases, it is believed that by Fall the shortage of copper may force a return to steel cases in a number of sizes.

These cases may be made by the method of securing final physicals by heat treatment, a procedure long in poor favor in Washington ordnance circles.

All ammunition production, after falling off to a very low level will likely show some sharp spurts by mid-summer.

► President Vargas of Brazil will shortly visit the U. S., and one of the chief topics of discussion between him and Washington officials will be his pet National Steel Co., at Volta Redonda.

► The first steel from captured Italian plants was forthcoming during the past week, according to reports from Bari, Italy. The British rebuilt the Bari plant, the output of which is chiefly structurals.

Another plant of similar capacity is being renovated by American engineers in southern Italy. Together, these plants are expected to supply upwards of 50 per cent of certain types steel requirements of invading armies, saving considerable shipping space.

► Japanese newspapers report that American aircraft are operating with flame throwers in the Pacific. Indications are that strafing planes are equipped with trailing hoses for a flame treatment just prior to the first invasion wave.

► Germany has just announced a liquid cooled motor of 2700 hp. This is the first specific public announcement by any belligerent of motors of over 2000 hp., although the Allies are known to be very interested in the more powerful motors.

The German motor is made up of two 12-cylinder inverted-vee in-line motors coupled together to form a single power unit.

► Germans also report that each night fighter pilot has his own staff officer on the ground who sits before an illuminated plate on which the two aircraft--the fighter and the Allied bomber formations--are projected. The staff officer directs the fighter in shortest possible time to various bomber groups.

► The high wing will replace the low-wing monoplane in future air liner designs, according to TWA's J. C. Franklin. The fuselage is nearer the ground, there is greater economy in loading, and passengers have an unobstructed view of the ground. The English have always favored the high wing in their designs.

► The flash bomb for taking night photographs has been developed to a point of remarkable precision. The bomb is 3 ft. long and $4\frac{1}{2}$ in. in diameter, and recent ones develop a peak light intensity of 170,000,000 candle power.

The bomb is so designed to trail far behind the airplane during its downward path, and explodes about halfway between the plane and the ground.

► Experience in controlled atmosphere heat treating paved the way for gas pickling, which cuts pickling time to a fraction by converting oxides on steel surfaces to vaporized chlorides. Gas pickling is expected to prove adaptable for preparing metals for all types of coatings; obviates the necessity for spent pickling liquor disposal; and in some instances eliminates subsequent anneals.

► A method of briquetting turnings that have been heated to the fusing point yields briquettes of various set sizes that are at least 80 per cent solid metal. Experiments on brass, aluminum, magnesium, steel, and added alloys indicates that analyses can be accurately controlled.

► Postwar machine tool designs tend toward greater automaticity with the burden of production speed and accuracy dependent on the machine rather than the operator.

Success in training green help to do only operation with semi-automatic equipment is one of the factors behind this trend.

► The impact of war has resulted in a tremendous growth of the diesel industry with monthly output about equal to that recorded in entire prewar years.

Industry proponents expect one big postwar field will be in fishing boats and long distance trucks. Although diesel people figure that the railroad field is a fait accompli, gas turbines may be a postwar challenger for position in this field.

Operation and Possibilities of

Gas Pickling of Steel

. . . The first commercial gas pickling line was installed in 1940. Since that time the results have indicated that this process has many characteristics making it readily adaptable to continuous electrogalvanizing and electrotinning lines. Further, it obviates the necessity for disposal of spent pickling liquors, a problem increasingly troublesome to steel mills. Herein the operation of the process is described, and photomicrographs are shown to indicate the type of surface condition obtained.

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By J. J. TURIN

Physicist, Surface Combustion Co., Toledo

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STEEL is ordinarily protected from corrosion by the application of a protective coating of another metal, an enamel, or a lacquer. It is well known that the preparation of the basis steel for the reception of the protective coating is a supremely important step in the corrosion protection of the steel. The character of the protective coating obtained is determined not only by the chemical cleanliness of the basis metal surface, but by its physical properties as well. It has been demonstrated that the physical properties of the basis metal surface before coating can contribute in a remarkable way to the character of the protective coating obtained.

The quality or the nature of the pretreatment of metal surfaces affects the character of the coatings produced, whether they be obtained by hot dipping, electrolytic plating, or enameling. Extreme care in the preparation of the metal surface must be closely observed where the material must be distorted, bent, or drawn after the protective coating has been applied.

In this age where continuity of process and large production is a well established goal, little need be said about the value that can be attached to a tenacious zinc coating which can be applied continuously to cold reduced steel strip and which will suffer the most severe distortions and drawing that the basis metal can withstand without flaking, cracking, or otherwise losing its corrosion resisting properties. It is well known that the steel industry was just launching into a transition from the galvanizing of hot rolled sheets to continuous galvanizing of cold reduced strip steel at the outbreak of the present war.

The nature of the gas pickling process is such that it can make a real contribution to the conversion from sheet to continuous strip processing.

Prior to 1937, controlled atmospheres were commonly used for the protection of steel against oxidation, for controlling carbon concentration in steels, for carburizing, for hardening, and a multitude of other operations. It was no great jump from the

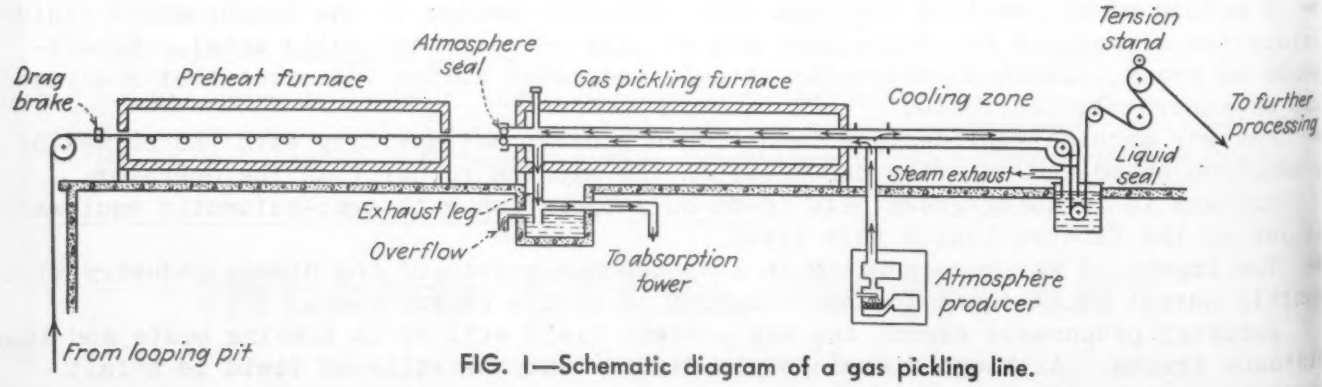


FIG. 1—Schematic diagram of a gas pickling line.

consideration of processes which dealt with suppressing oxidation to the process of removing, in the form of vapors and gases, oxides already present on steel strip. *The development of the gas pickling process to remove oxides and other surface impurities from steel strip as vapors was, therefore, a natural way to apply the information and experience already gained in the use of controlled atmospheres from previous applications.*

In 1937 the study of the gas pickling process was initiated with the idea of eliminating the blisters often encountered in the galvanizing of sheets due to acid pickling. Galvanized sheets, prepared by gas pickling before being coated, not only demonstrated that blisters were non-existent but that the coating was far more adherent, and generally superior to the product obtained when the same coating practice was applied to a wet pickled sheet. The gas pickling process was next applied to cold reduced strip with most satisfactory results, and soon the process was sufficiently developed so that the first commercial installation was undertaken in the spring of 1940. After some original growing pains this line was placed into commercial operation with very successful results and is still so operating.

Steel is generally prepared for coating by pickling in acids. The pickling operation is generally preceded by a cleaning operation designed to remove oils, sludges, and other materials, and usually consists of an alkali wash or hydrocarbon degreasing operation of some kind. Material thus pickled is then thoroughly rinsed in the attempt to remove all the salts from pickling before the coating is applied. Blisters caused by hydrogen in the hot dipped coatings have been an ever present evil resulting from acid pickling, and often a careful control of the analyses of steels used for this purpose is practiced. In some instances electrolytic pickling, electrolytic cleaning in molten salt solutions, and even gaseous deoxidation of the basis metal surface has been utilized to obtain special advantages in the coated product.

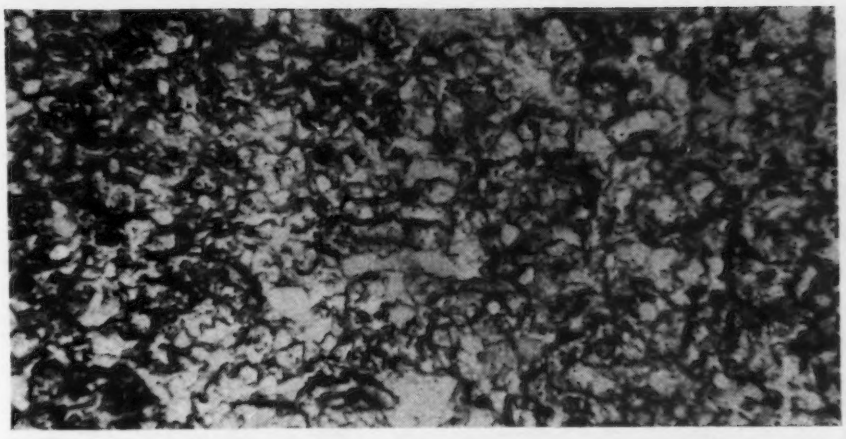


FIG. 2—Formvar replica of acid pickled steel. At 216 diameters.

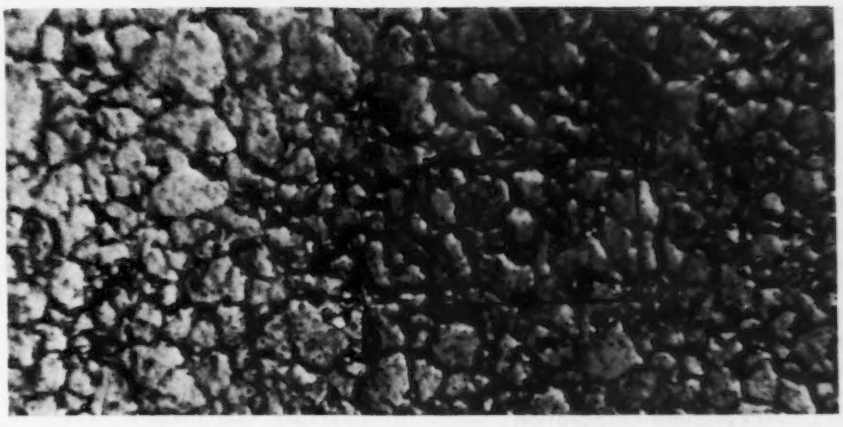


FIG. 3—Formvar replica of gas pickled steel. At 216 diameters.

The gas pickling process removes oxides present on steel by converting those oxides into vaporized chlorides by reaction with hydrogen chloride gas at elevated temperatures. The reaction may be carried out in a gas tight externally heated chamber composed of chromium-nickel iron alloy, or in a refractory lined internally heated chamber.

The process gives a preferred surface for coating, exhibits none of the faults of acid pickling, and does not require a cleaning operation to precede it since the oils and sludges are positively removed by burning them off.

The application of the gas pickling process to strip steel is similar to the conventional atmosphere furnace applications and is best illustrated by referring to the schematic diagram in Fig. 1. The strip is uncoiled and passed into the preheating furnace where the oil is burned off and the strip is simultaneously heated to the

FIG. 4—Replica profile of acid pickled steel. At 216 diameters.

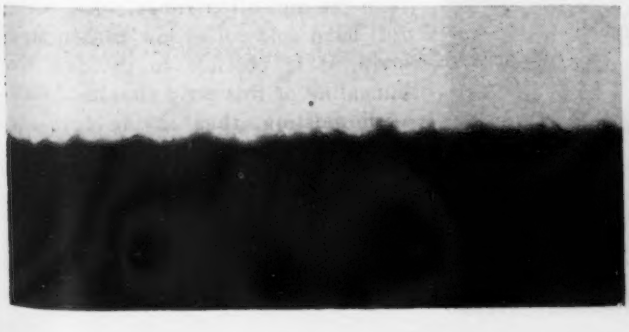


FIG. 5—Replica profile of gas pickled steel. At 216 diameters.

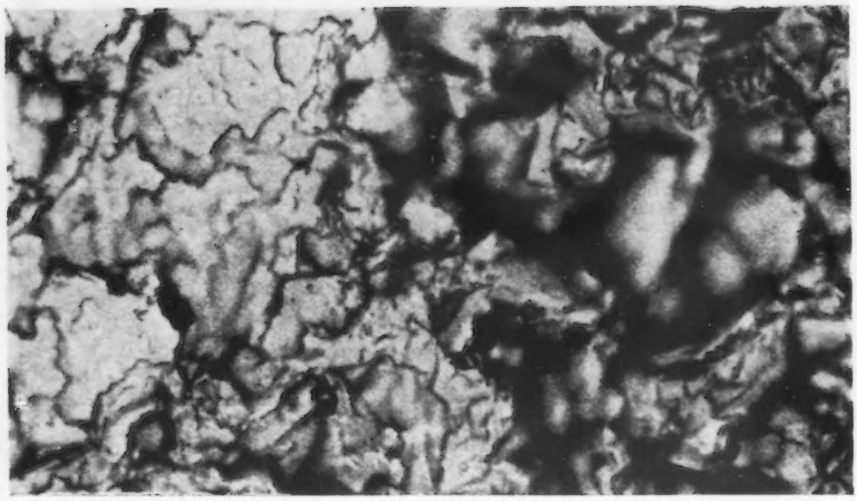


FIG. 6—Replica of acid pickled steel. At 970 diameters. Focal plane at top of replica.

pickling temperature (1100 deg. to 1350 deg. F). From the preheat furnace it passes through an atmosphere seal into the muffle of the gas pickling furnace. Here the strip contacts the pickling gas which is introduced at the discharge end of the furnace and caused to flow counter to the strip. Emerging from the furnace the strip enters a cooling zone, and when it has cooled sufficiently, it passes through a liquid seal and then out into the air. From there the strip goes on to further processing, and may be coated, or washed and dried.

Atmosphere Preparation

The gas pickling atmosphere is produced by burning a hydrocarbon gas with chlorine gas and air in a refractory lined combustion chamber. The chlorine is furnished in tank cars as a liquid, is vaporized by heating and then mixed with the natural gas and air in the proper proportions.

When these three gases are mixed and ignited, a selective combustion occurs. The hydrogen present in the hydrocarbon combines selectively with the chlorine and the carbon present in the hydrocarbon combines selectively with the oxygen of the air.

The selective combustion is illustrated using the simple hydrocarbon, methane. The typical reaction which takes place during the combustion of methane with chlorine and air is illustrated by reaction (1):

$$(1)\quad CH_4 + 2\,Cl_2 + 5\left(\frac{O_2 + 4\,N_2}{5}\right) = 4\,HCl + CO_2 + 4\,N_2$$

(*Air*)

One part of methane burned with two parts of chlorine and five parts of air results in a mixture which has four parts of hydrogen chloride gas, one part of carbon dioxide gas, and four parts of nitrogen. This is roughly 44.5 per cent hydrogen chloride gas, 11 per cent carbon dioxide gas, and 44.5 per cent nitrogen. By controlling the proportions carefully, water vapor may be excluded from the end products of the combustion. Similarly the reducing gas, carbon monoxide, or oxygen may be obtained depending upon the original proportions used.

The proper proportions necessary for a given fuel gas can be easily calculated if the analysis of the natural gas is known. The composition of the atmosphere obtained by burning a 1000 B.t.u. natural gas with chlorine and air in the proper proportion is usually approximately 40 per cent HCl, 10 per cent CO_2, and the remainder nitrogen. This "chlorine burner" gas is then diluted with an equal amount of dehydrated flue gas, which is produced by burning a mixture of natural gas and air and cooling the products to water temperature. This expedient serves to reduce the temperature of the pickling gas entering the muffle to approximately the temperature of the muffle and also increase the total volume of gases formed, so that the velocity of pickling gas over the work may be maintained as high as possible. The dry pickling atmosphere introduced into the muffle, therefore, will be approximately 20 per cent HCl, 10 per cent CO_2, and the remainder nitrogen.

In practice the control system is so designed that the proportions between the three gases are automatically maintained. Usually a continuous instrument records the flow of chlorine so a continuous check on this item is provided.

This method of atmosphere production is simple and inexpensive. Since all the items required, that is, hydrocarbon gas, chlorine and air, are readily available and can easily be handled commercially, this method provides an easy way of producing a mixture containing hydrogen chloride gas, carbon dioxide, and nitrogen which is free from water vapor.

FIG. 7—Replica of acid pickled steel. At 970 diameters. Focal plane 5 microns below top of replica.

Strip Preheating

Ordinarily it is common practice to remove the oils from the cold reduction operation by some cleaning method.

Since the gas pickling temperature is in the annealing range, when using full hard cold rolled low carbon steel strip, it is possible to perform the annealing of this strip simultaneously with pickling, thus saving both the cleaning and separate box annealing ordinarily followed.

The strip may be passed into the pickling muffle without preheating, thus avoiding the formation of any more oxide than exists on the strip

prior to treatment. However, heating in a muffle is relatively slow, and since the strip cannot react with the gas until its temperature has been suitably elevated the pickling furnace would not be used efficiently. Therefore, it is preferable to heat the strip to reaction temperature in a furnace designed for fast heating and then pickle the strip after it has reached reaction temperature in a separate furnace.

The preheating operation can be carried out in an atmosphere furnace and thus heat the strip efficiently while avoiding the formation of further oxide during heating. However, direct flame application is much more rapid than indirect heating and is by far more economical. It forms some additional oxide but is very desirable because it satisfactorily burns off oils and other compounds which may be present on the surface of the work.

Although any of these methods of heating the strip may be selected, the rate of heating will determine the length of the preheating furnace for a given strip speed. The amount and type of oxide which must be removed will determine the pickling time, and therefore, determine the length of the pickling furnace required for a given strip speed.

A direct-fired preheating furnace was selected for the first application because of its simplicity and because the analysis of the combustion products can be controlled so that no severe oxidation results in the short time required for preheating the strip.

The preheat furnace is a simple direct-fired tunnel with zone control, and is capable of operating between 1500 deg. and 1700 deg. F. The atmosphere is maintained slightly on the reducing side to suppress the formation of oxide.

The exit temperature of the strip is controlled not only by the heat input of the burners but also by the speed of the strip through the furnace. When changing from one gage to another, the speed is so controlled that the tonnage passing through the furnace, per unit of width of the strip, always remains constant. In other words, the furnace is capable of heating a given weight of steel per unit time regardless of the thickness of the strip.

Gas Pickling Furnace

The gas pickling furnace is of simple muffle type construction. The pickling chamber, or muffle, is composed of heat resisting alloy of the 25 chrome-12 nickel variety and is heated externally with simple burners. The furnace is designed so that it is capable of holding temperatures from 1000 deg. to 1350 deg. Since the strip enters the muffle furnace in a heated condition, only the heat required for radiation from the furnace plus the heat required for reaction must be furnished to this furnace. Since the reaction is practically heat balanced, the gas pickling furnace is merely a heat holding furnace.

The pickling gas is introduced at the work discharge end of the furnace, top and bottom of the strip, and caused to flow counter to the direction of motion of the strip. The strip is supported on horizontal bars in the muffle elevated from the floor of the muffle so that the gas may react simultaneously with both sides of the strip. The discharge end of the muffle is directly connected to an extension of the muffle composing the cooling zone, and the charge end of the muffle is equipped with a simple atmosphere seal. The vaporized chlorides formed in the furnace, together with the unreacted muffle gases, are withdrawn from the muffle through two hot exhaust wash legs located on either side of the muffle and just inside the charge end of the furnace.

The waste gases and vapors which have been formed during the reaction will contain ferric chloride vapor, unused hydrogen chloride gas, carbon dioxide, carbon monoxide, nitrogen, and water vapor. These gases cannot be vented into the atmosphere until the ferric chloride and hydrogen chloride have been removed. The ferric chloride is removed in the hot exhaust legs by washing with water and the remaining gases are passed through a water absorption tower to remove the remaining hydrogen chloride gas. The carbon oxides and nitrogen are vented to the atmosphere.

Since air must be prevented from entering the reaction chamber, charge and discharge seals for the strip are required. Ordinarily, in controlled atmosphere furnaces, sufficient pressure above atmospheric is maintained in the reaction zones so that the leakage will always be outward through the ordinary types of seals. In this application, if the pickling gas was allowed to pass out into the air, it

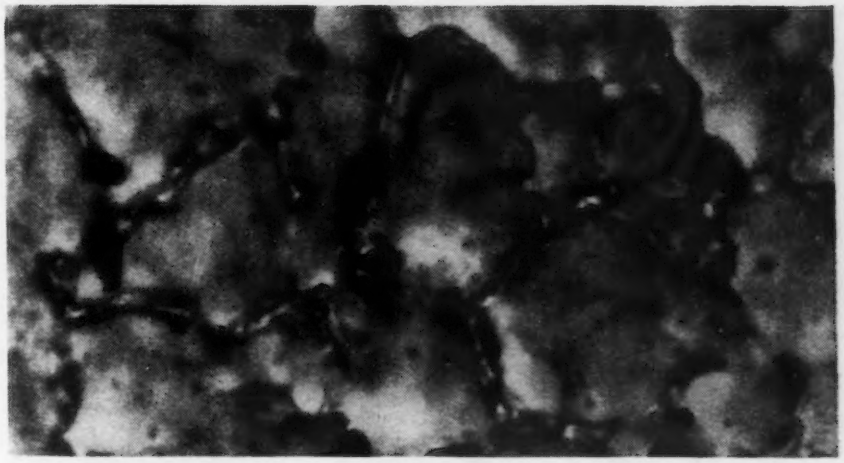
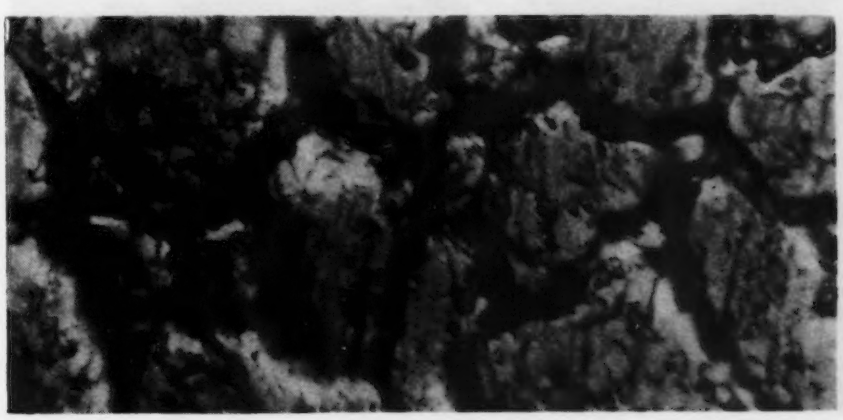


FIG. 8—Replica of gas pickled steel. At 970 diameters. Focal plane 5 microns above crystal face

FIG. 9—Replica of gas pickled steel. At 970 diameters. Focal plane in plane of crystal faces.



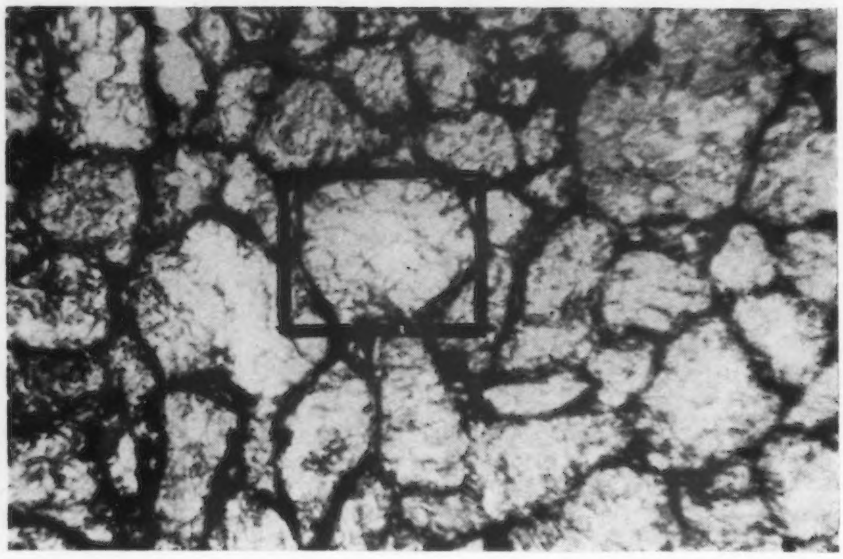


FIG. 10—Replica of deep etch, gas pickled, hot rolled steel. At 216 diameters.

would cause an unpleasant operating condition and also cause corrosion wherever absorbed by moisture. To eliminate this problem, the whole system is put under a slightly subatmospheric pressure to prevent the escape of dry pickling gas into the air before it has been washed. This is accomplished by placing an eductor above the main absorption tower so that the muffle gases are sucked from the muffle and into the absorption tower. The inlet seal, therefore, becomes a relatively simple contrivance of loose rolls, one above and one below the strip. The eductor at the end of the absorption tower then draws some air into the muffle with the entering strip and sucks this air into the exhaust legs with muffle gas coming from the opposite direction.

Experience has demonstrated that there is very little deterioration of the heat-resisting muffle under the attack of the gas pickling atmosphere. Although the gas reacts with steel and the oxides of irons, there is a film of nonvolatile nickel and chromium chlorides formed on the inside of the muffle which then serves to protect the muffle from further attack by the atmosphere gas. No excessive corrosion or deterioration of the muffle has been observed in practice, and the life of the muffle is expected to be the same as when used under ordinary heating conditions.

Cooling Zone

The treatment of the strip after it is removed from the gas pickling chamber is important. Since the strip is hot it would oxidize if it was brought into contact with air. To avoid such oxidation the strip is passed through a cooling zone where a small flow of pickling gas protects the steel against reoxidation. The strip is cooled to a sufficiently low temperature in the zone so that it may be passed through a liquid seal which acts to prevent the pickle gas from leaking into the atmosphere.

Since the gas pickling muffle itself is maintained under suction, no pickling gas can leak out into the atmosphere when leaks occur. Because of the oxidizing nature of the reactions taking place in the muffle, small leakages of air have no critical effects upon the pickling operation.

After passing through the water seal, the strip goes on to further processing.

Operation Characteristics

The nature of the process makes it desirable to run the strip continuously without stopping to change coils. Consequently the necessary coilers and uncoilers, strip welder, looping pits, and shears that are required to maintain a continuity of flow have been included in the line.

Since the preheat furnace and muffle furnace are of equal length, the time for preheating and for reaction is the same.

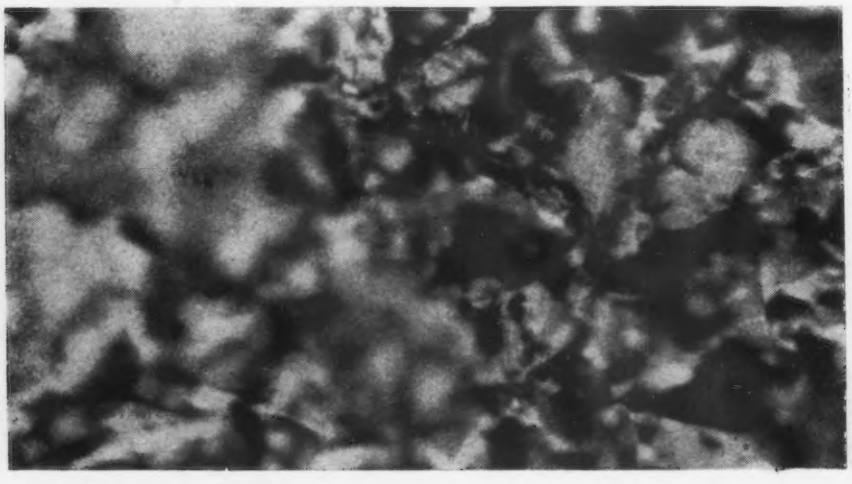
Since the line runs on a constant tonnage basis, the speed of the strip for 0.025-in. material would be twice the speed of the strip when operating on 0.050-in. material. Consequently, the number of square feet of strip surface of light gage material pickled at constant tonnage would be double that of the area treated per unit of time for heavy gage material. Practice, however, has ascertained that the smallest volume of atmosphere that can be used to fill the muffle is not only sufficient to pickle the heavy gages but the light gages as well.

The pickling time varies from approximately 10 sec. for light gage materials to 1 min. for heavier gage materials. This variation occurs because the preheat furnace runs on constant tonnage whereas the dry pickling furnace is designed to treat a constant area of surface per unit of time.

In actual practice the only thing that need be controlled, or varied, on the line is the inlet temperature of the strip when passing into the gas pickling muffle. When changing gage, the operator need only refer to a set of constant tonnage curves that indicate how to vary the speed of the line for the new gage and still maintain constant tonnage. In this manner various gages may be run alternately without stopping or interrupting the line.

The atmosphere producing unit, once adjusted, operates automatically in the same fashion as a conventional DX gas producer and need not be varied or adjusted during operation.

FIG. 11—Rectangular area shown in Fig. 10. At 970 diameters. Crystal face in focus.



The application of the pickling process to galvanizing has thus far demonstrated that the process leads to a far more adherent coating than can ordinarily be produced. Under suitable conditions super-galvanized coatings having remarkable drawing properties have been regularly produced.

Results

Cold reduced strip steels, which have been in limited use for galvanizing, when prepared for coating by the gas pickling process have exhibited results superior to hot rolled sheets coated by conventional methods. The process gives promise of handling a wider range of steels for galvanizing than seems possible at present by means of ordinary acid pickling processes. Steel used for the manufacture of high grade telephone wire has been successfully galvanized using the gas pickling process preparatory to coating.

Since the application of a zinc coating to a gas pickled surface has invariably led to a more adherent coating than could be produced using the same coating practice on an acid pickled surface, a comparative study of the surfaces of gas pickled and acid pickled steels was initiated with the idea of discovering what properties of the gas pickled surface were responsible for this difference in coating adherence. Although the research is far from complete, many important factors concerning the character of steel surfaces have been revealed.

The first surface studies were made on various samples of gas and acid pickled steels by direct microscopic examination of the surface under reflected light at high magnifications. The results of this work definitely indicated there was a great difference between gas and acid pickled surfaces. However, because of the irregularities in the surface, it was impossible to raise the magnification to the point where the differences could be distinctly resolved and still maintain the necessary depth of focus.

The aid of the Ohio State University Research Staff was enlisted and they attacked the problem by preparing replicas of the various surfaces of steel by flowing a solution of polyvinal formal (Formvar) on the surface, allowing it to dry and subsequently stripping the dried film from the steel. A suitable lubricant forming what is considered a monomolecular layer between the Formvar and the steel was used to overcome cohesive forces. The film was made sufficiently thick to obviate appreciable stretching during the stripping.

These replicas, when examined microscopically under transmitted light, could be magnified to the point where a distinct resolution of the differences between gas and acid pickled surfaces was revealed.

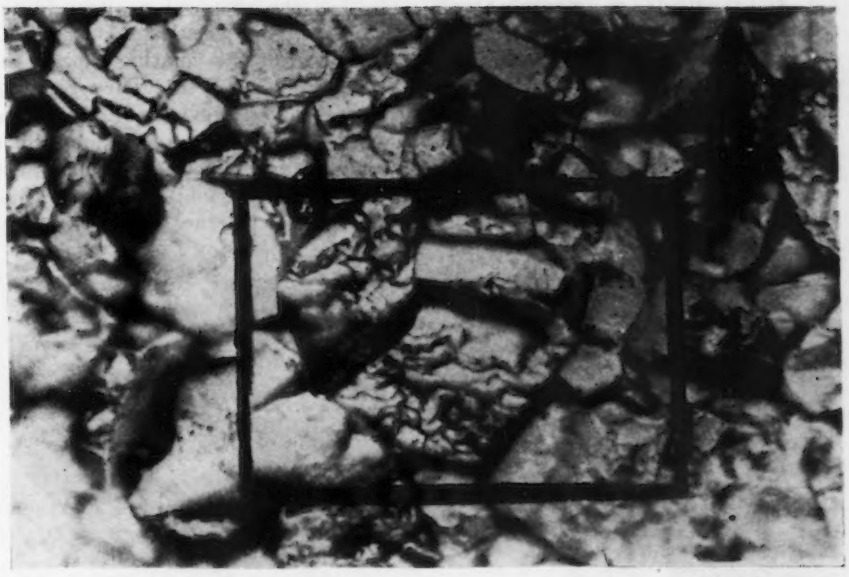


FIG. 12—Replica of acid pickled, deep etch, large grain steel. At 970 diameters.

It may be of some interest to point out that the replica films deposited on the acid pickled specimens could be removed without even bending the films, whereas the films of equal thickness deposited on the gas pickled surfaces adhered most tenaciously. In view of the fact that the cohesive forces have been greatly reduced, or entirely eliminated, through use of the above indicated lubricant, it appears that the difference in strength of the bond between the steel and the Formvar in the two cases may be explained by the degree of mechanical interlocking of the two materials. This hypothesis is well substantiated by the accompanying photomicrographs.

The photomicrographs of negative Formvar replicas of lightly etched gas pickled and acid pickled samples of the same strip steel surfaces are shown in Figs. 2 and 3, taken at a magnification of 216 diameters. In Figs. 4 and 5 the profiles of surfaces have been obtained by folding the negative Formvar replicas shown in Figs. 2 and 3. Attention is directed to the fibrous projections which are present only on the gas pickled profile and which represent etched trenches in the original specimen. This plate illustrates that the reason the Formvar was difficult to remove from the gas pickled steel surface was that it was anchored to the surface by projections similar to the roots of a tree.

Figs. 6 and 7 are enlargements of Fig 2, and Figs. 8 and 9 are enlargements of the rectangular area of Fig. 3. These photomicrographs further illustrate the differences in the etch and emphasize the depth characteristics of either etch.

Figs. 10, 11, 12 and 13 illustrate the difference of gas and acid pickled

FIG. 13—Rectangular area shown in Fig. 12. At 1945 diameters.

hot rolled steels at magnifications from 216 to 1945 diameters.

Fig. 14 is an electron micrograph of a positive quartz replica of a gas pickled surface at a magnification of 17,400 diameters. The dotted lines indicate the boundaries, or etched trenches about the crystals shown in Fig. 9 at lower magnification. Of

FIG. 14—Electron micrograph of quartz replica of gas pickled steel. At 17,400 diameters.

significance is the demonstration of finer etch trenches between the smaller crystals composing the large outlined crystals. These electron micrographs suggest that there exists a mechanical bonding between the steel and a superposed material within the boundaries of the crystal faces shown in the photomicrographs and that this is of the same character as the coarser mechanical bond.

The reason for the superior adherence of the applied protective coating to the gas pickled surface is divided between the chemical purity and the physical characteristics of the surface.

Because of the volatilization of the product chlorides, they are removed from the fine crevices of the metal surface and are not pocketed in a crevice from which they cannot be washed. Consequently, gas pickling results in a surface which by comparison to liquid pickling is far more chemically pure and clean. At the high temperature of operation, the reaction of gases with the metal surface will take place much more uniformly and give rise to a surface which might be described as more "minutely uneven" than the surface produced by the non-uniform action of an acid solution. Such a surface, as the photomicrographs demonstrate, has a much greater gripping area per unit of surface than the coarsely crystalline surface ordinarily obtained.

These photographs clearly demonstrate that the surface structure obtained by gas pickling is quite different from that obtained with acid pickling. When an etched surface is obtained with acid pickling, it is usually jagged and crystalline and presents the appearance of having whole grains of metal removed from the surface of the metal. The surface structure obtained by gas pickling is best described as a subcrystalline etching, that is to say, the attack of the gases has not removed whole grains from the surface, but has rendered the surface of each grain "minutely even."

Summary of Advantages

The fundamental advantages of the gas pickling process are:

(1) Cleaning of the metal surface is accomplished without gas absorption by the metal, regardless of the length of time the work is acted upon by the active gases.

(2) Oxides can be removed in a fraction of the time necessary to pickle in acids, and the basis metal itself can be etched to any desired degree with the same rapidity.

(3) A preferred surface for the application of protective coatings is obtained.

(4) The economics of the process compare favorably with the cost of acid pickling.

(5) No degreaser is needed to precede the method of cleaning.

(6) Annealing and pickling can be accomplished as a single operation.

Future Applications

Although because of the war the gas pickling process has been applied commercially only to galvanizing, it is believed that in the postwar period the process is capable of making valuable contributions in the preparation of metals for coating generally.

Samples prepared for enameling have demonstrated superior results, and it is expected that the process can be applied to hot dipped or electrolytic tinplate with the expectation of minimizing or eliminating pinholes and other defects.

Since the reaction products of the process are anhydrous salts, it is felt that the regeneration of the reaction products to recover chlorine gas for reuse in the process may prove to be a simple operation by comparison to the reclamation of acid pickle waste solutions. Studies on this regeneration are now underway, and if they prove to be successful they may provide the key to the solution of the acid waste disposal problem which must be faced by the steel industry in the postwar world.

Kirksite Molds for Plastics

. . . With the short production runs encountered in the aircraft industry, the same economic factors relating to die costs prevail in molding plastics as in forming sheet metal. This report, digested from a paper recently presented before a Los Angeles conference of the Society of Plastic Industries, summarizes the results of tests made at Lockheed Aircraft Corp. to determine whether cast zinc alloy molds could be used in place of the much more costly alloy steel molds ordinarily used for plastics. The tests demonstrate that Kirksite can be used successfully for high pressure transfer molds and also for compression molding of laminates, using heated platens. Deep cavities can be hobbed in the zinc alloy provided it is first heated to 350 deg. F.

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USE of steel for plastic molds has long been accepted because of its low upkeep cost, long life and good quality of parts produced. Although the original cost is usually quite high, the cost per part is low. With the comparatively small number of identical parts required in aircraft production, however, the mold cost per part is high and the life of the mold has barely started when the production run is completed. The time required to make steel tooling has been a further impediment to the use of plastic molded parts.

Various materials have been considered through the use of which the original mold cost could be reduced and yet obtain a low upkeep cost, good quality and sufficient life for molding the required number of parts. In order to test the possibilities of using Kirksite zinc alloy as a mold construction material, it was decided to construct such a mold for a hook antenna mast.

Transfer Mold Selected

This part was selected because of its complexity and because it would prove many points if the mold were successful. The antenna mast is a large molding, 31 cu. in., with a large core and insert. Great differences in wall thicknesses exist—from ⅛ to ½ in.—and a macerated cloth filled molding compound requiring high pressure was specified. Due to the coring, insert and variation in wall thickness involved, the only approach was through the transfer molding method.

The mold was designed on the basis of 350 deg. F. as the top operating temperature and 10,000 lb. per sq. in. as the maximum molding pressure to be encountered. The breakdown of the mold is shown in an "exploded view" in Fig. 1.

The core had to be located in a definite position with respect to the mold cavity, since the core back was used as the mast base. This resulted in high pressures against the core block during the molding operation. By locating the core back in a groove and using two steel pins through the back to the top and bottom steel plates, however, the position of the core was definitely fixed and considerable load could be taken by the guide pins to the steel plates.

The sprues were located 120 deg. from a common center and were so gated that the material would flow to all parts of the cavity. By bringing the material in at the parting line of the mold, there was very little force tending to deflect the core or to shear the insert. This arrangement also facilitated finishing the molded part.

Making the Cast Mold

The procedure for the construction of the mold in Kirksite was as follows:

Master wood patterns of the core and the mast were made from which plaster splashes were prepared. From these plaster splashes and wood patterns, Kirksite sand castings of the core and the two halves of the mold were made. Copper tubes were cast in each half of the mold to provide for steam heating if required, but actually this was found not to be necessary because of the bulk of the mold. In operation all heating was accomplished by thermal transfer from hot plates. Finishing operations on the castings consisted of scraping, machining, polishing and fitting.

The greatest difficulty experienced in the construction of the mold was the porosity of the cast material in the region of the cavity. Although new Kirksite was specified, it was later found that remelt had been used and this undoubtedly was partly responsible.

Surface imperfections which were uncovered when the die cavity was scraped during finishing were repaired by one of two methods: (1) preheating the die and welding the

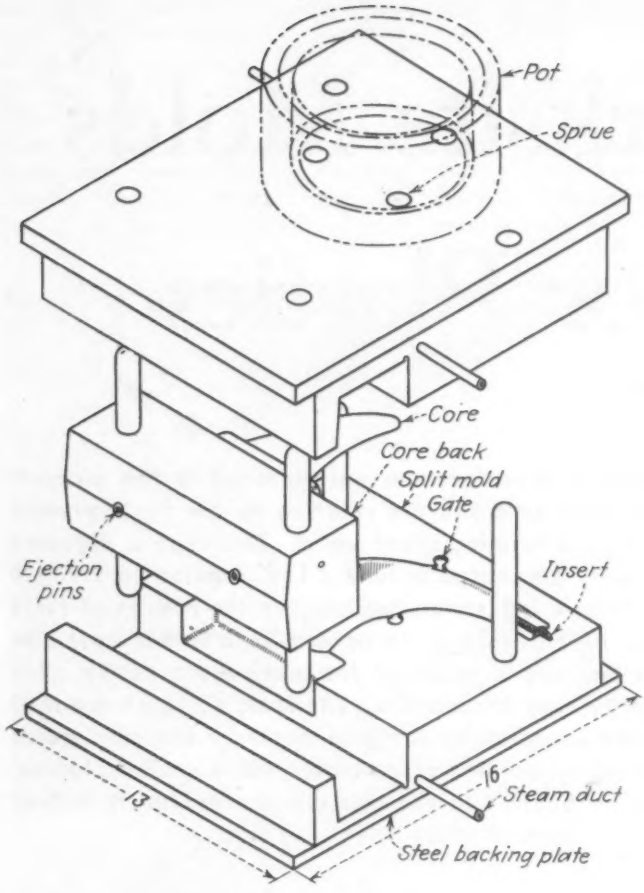


FIG. 1 — Exploded view of the Kirksite Transfer mold for the hook antenna mast.

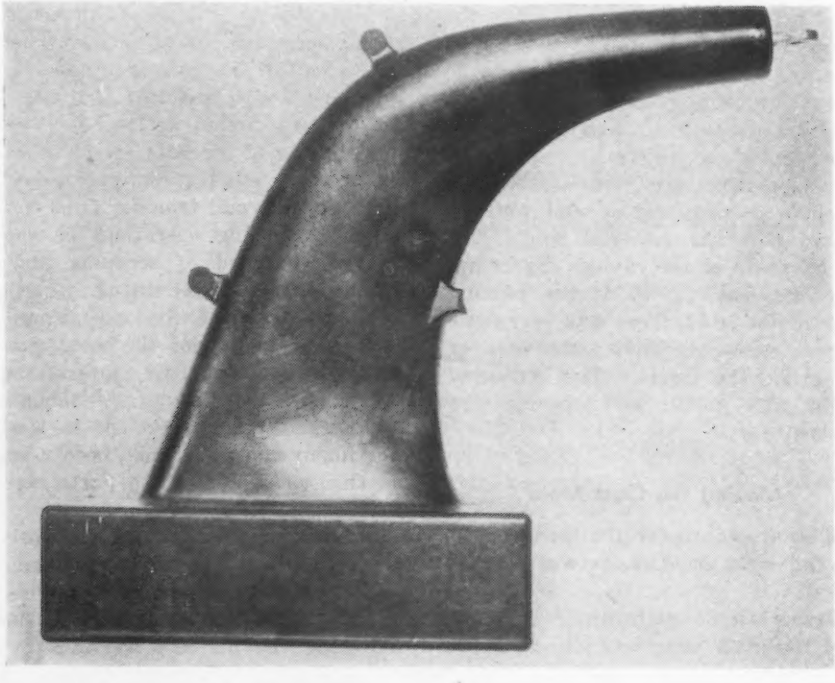
pitted area, followed by rescraping, or (2) by drilling the pitted area so that it could be plugged with Kirksite wire. The latter method was applied after most of the machining was complete, since it eliminated the possibility of die warpage.

Several adjustments had to be made in the mold to correct the difference in the thermal coefficients of expansion of the steel plate, the steel pins and the Kirksite casting. In addition, the transfer pot was modified so that it would be definitely located with respect to the sprues.

Satisfactory parts were molded in this Kirksite die using a relatively soft flowing phenol formaldehyde material (50 per cent each of Bakelite No. 120 and No. 6012). However, the size of the gates had to be increased before the flow was satisfactory when a macerated cloth filled phenolic was used. The plastic part as it appeared on ejection from the mold is shown in Fig. 2. These moldings were satisfactory both in appearance and functional strength and to the present time approximately 80 production plastic antenna masts have been molded. Careful measurements indicate the dimensions of the Kirksite mold cavity have not changed as a result of this limited molding and no degradation of the surface of the cavity was discernible.

A later independent investigation was conducted casting Kirksite into Antioch plaster molds. Compared with castings made in sand, a substantial improvement in the surface smoothness was apparent and freedom from pits, sand entrainment and blow holes was obtained.

Fig. 2—Hook antenna mast as removed from mold.



Hobbing Practice Studied

After the establishment of the suitability of Kirksite as a material suitable for the construction of transfer molds, a further study was made to determine the hobbing characteristics of the zinc alloy.

Hobbing is a process of forming a mold cavity by forcing a hardened steel master of the same shape as the molded object desired into a softer cavity blank, which may be subsequently trimmed, fitted to a chase, hardened and polished. The hobbing of alloy steel is performed at room temperature in a hydraulic press of large capacity. Auxiliary equipment essential to hobbing includes steel blocks of various sizes to support the work and a chase of retaining ring to confine the hobbing blank laterally and to force the metal in the blank to flow upward and remain tight against the hob.

The hob is made of a heat treatable alloy such as K-46 steel. (Jamison Steel Co.) It is made to the dimensions of the part to be molded with material shrinkage added. The finished hob is given a high polish after hardening, since the quality of the polishing is reflected in the finish of the hobbed cavity. For purpose of lubrication, the hob is generally copper plated by simple immersion in a solution of blue vitrol (copper sulphate).

The hobs shown in Fig. 3 were produced in order to determine the requisite conditions for applying the hobbing technique to Kirksite. These hobs are for stub antenna masts. It would be extremely difficult to machine the female cavity for molding this part

since it is narrow and deep. The alternative to hobbing would be a split cavity mold with the resultant problems of coordination of the mating portions of the die. This would result in a high die cost and additional finishing of the molded part.

The hob was produced from a wooden pattern of the part, using a Keller duplicator. The hob was given a preliminary polish, heat-treated to a hardness of 57 Rockwell C and then given a final polish. The hob was formed from K-46 steel. Billets of Kirksite were obtained in the "as cast" condition and placed in a hobbing chase 12 in. o.d., 6 in. i.d. and 6 in. thick.

These blanks were hobbed at room temperature (75 deg. F) and at 350 deg. F. The first hob was broken early in the experiment and the die showed cracks as indicated in Fig. 4. A second hob was subsequently produced, identical in all respects to the original hob except that the groove in the end of the hob was eliminated. With this design a successfully hobbed cavity was obtained. This cavity block was trimmed to size and mounted along with suitable accessories as shown in Fig. 5 and 6, and parts were successfully molded.

Poor Ductility at 75 Deg. F.

As a result of tests on these and other hobs, a number of points concerning the hobbing of Kirksite were observed. In the first place, the poor ductility and low elongation of cast Kirksite make hobbing impractical at room temperature. Even at the elevated temperature of 350 deg. F., this zinc alloy does not flow plastically to an appreciable extent, although the tendency to tear and crack showed a marked decrease at this temperature. This was apparent when it was observed that the relief holes drilled in the bottom of the Kirksite billet failed to extrude full of the material displaced by the hob. Using annealed alloy steel, such relief holes would be entirely filled. In the case of Kirksite, the relief holes were hardly out of round. This would lead to the conclusion that considerable forging action had occurred during the hobbing and this was somewhat confirmed by the high pitched ring which resulted when the cavity block was tapped with a ball hammer. The density of the material comprising the cavity proper appeared to be greater and the material was definitely harder and more scratch resistant than in the "as-cast" condition. This forging property corresponds to the last heat treatment generally given steel cavity

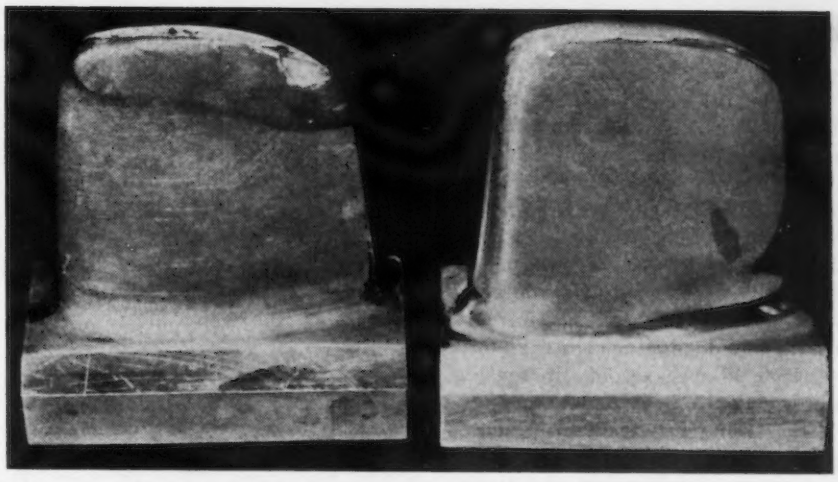


FIG. 3—Hobs for stub antenna masts. The left hand hob in the photograph possesses a groove in the end while the right hand hob does not.

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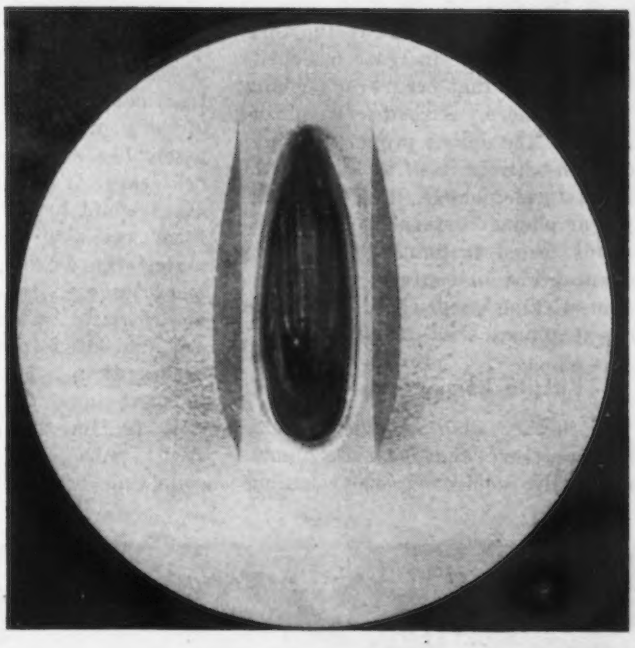

FIG. 4 — Cavity hobbed at room temperature in cast Kirksite. Note cracks at both edges of the cavity. Careful observation will also disclose the fin-like extrusion in the bottom of the cavity which corresponds to the groove in the end of the antenna mast hob shown at the left in Fig. 3. Volume displaced, 5.6 cu. in.; total load required, 1,018,000 lb.

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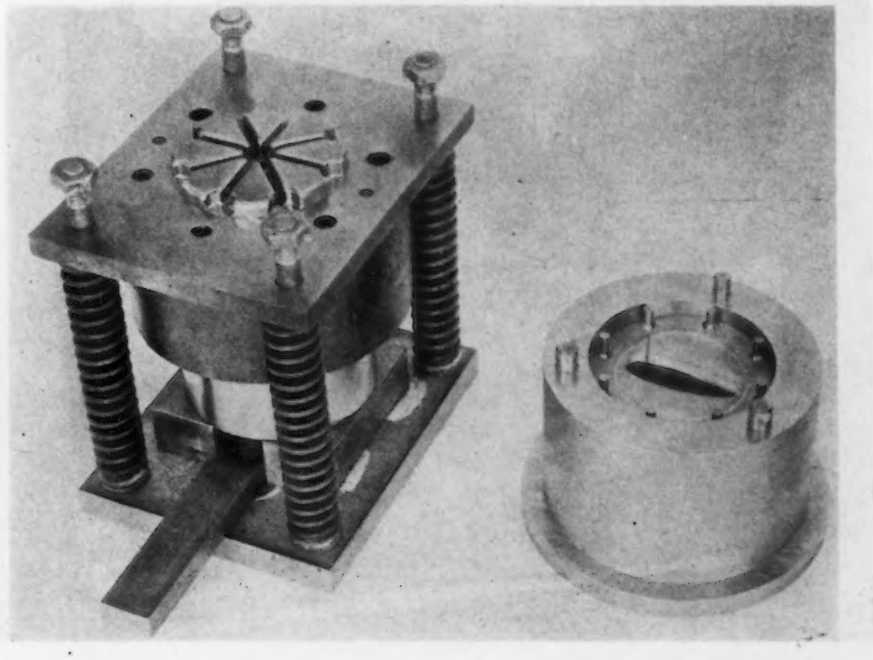
FIG. 5—Transfer mold for stub antenna mast showing pot and cover plate assembly removed from hobbed Kirksite cavity block and chase.



blocks after hobbing and probably consists of a combination of forging action and work hardening.

The general conclusion reached is that Kirksite is suitable for hobbing and may be specified as interchangeable with alloy hobbed steels where production requirements are light, as in aircraft. Although too little ductility and elongation is present at room temperature, at 350 deg. F. Kirksite can be hobbed successfully. Satisfactory displacement occurred at 3500-4500 lb. per sq. in., increasing with the depth hobbed.

After fitting to a steel mold chase, a Kirksite cavity block will sustain the pressure developed in the transfer molding cycle, which amounted to a fluid pressure of 1600 lb. per sq. in. in the case of the stub antenna mold. This is partly due to the forging action and the increase in density and hardness that occurs in hobbing.

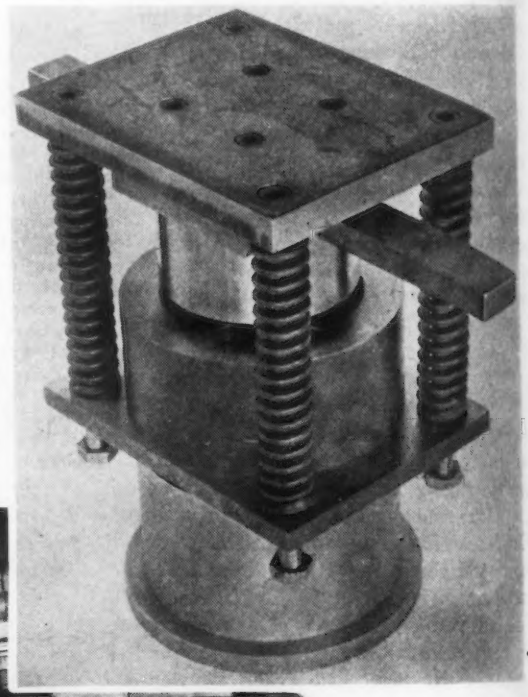
Furthermore, Kirksite in plastic molds has the unique property of nonadhesion between itself and any of the phenol formaldehyde, urea formaldehyde or phenol furfural molding compounds tested to date. This is very advantageous in contrast to the frequent sticking experienced in steel or chrome plated steel molds.

Kirksite Laminating Mold

To further disprove the common misconception that plastic parts necessarily require expensive tooling, tests were made with Kirksite compression molds for plastic laminates. In order to explore these possibilities, a typical section of the Lockheed Lightning main landing gear door was developed, utilizing an inner skin frame construction. For reasons of economy, only a 2 ft. section along the length of the inner skin frame was molded. It was in part the object of this experiment to demonstrate that numerous components such as aircraft doors and door frames, cowl and coolant flaps, control surfaces, floors, etc., can be molded on Kirksite tooling identical to the tooling required to form these parts from sheet metal except that heat is applied to the mold and the draw ring is eliminated.

A further object was to demonstrate that fractional components of the above mentioned assemblies such as inner skin frames for doors could be formed from available plastic materials and that more severe drawing and forming could be accommodated in such designs than is possible in sheet metal fabrication. In fact, the inner skin frame developed could not be produced from 24-SO aluminum alloy, even when heated to 450 deg. F., although as will be seen, the piece was successfully formed from a laminated plastic on the same die.

The mold was electrically heated to 315 deg. F., lubricated with zinc stearate dust and wiped with a cheesecloth. The laminating operation consisted of opening the mold about 3 in. or sufficient to slide 20 x 24 in. sheets of material into place, closing the mold as rapidly as possible (to full estimated pressure), "breathing" to allow the entrapped volatile to escape by momentarily releasing the pressure, applying the molding pressure and maintaining that pressure



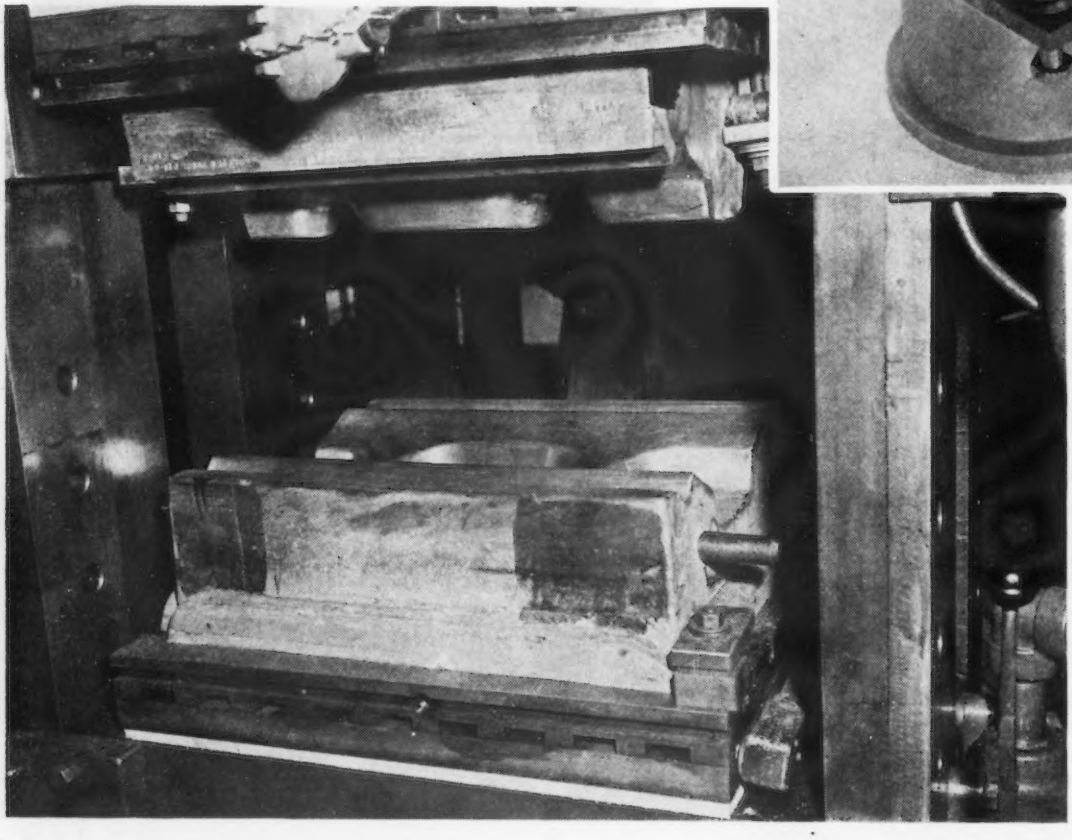


FIG. 6—Assembled transfer mold as it appeared assembled and ready for clamping into the molding press.

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FIG. 7 — Kirksite laminating mold mounted on hot-plates in 300-ton hydraulic molding press.

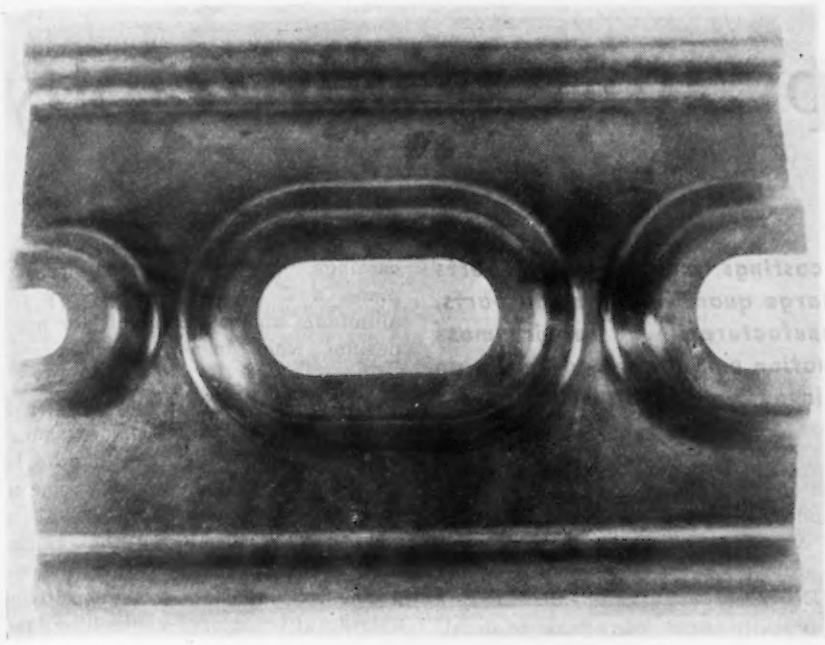

FIG. 8—View of back of inner skin frame molded on Kirksite dies from Resin X-crepe paper, shown after trimming and routing.

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for the curing cycle. The cure time varied from 3 to 5 min., depending upon the material and the number of layers. The press was then opened and the parts lifted from the mold.

After a number of runs with six different types of materials, inspection showed that no physical alteration had occurred in the Kirksite mold and an indefinite long life at pressures as great as 2000 lb. per sq. in. may be expected. The 315 deg. F. operating pressure likewise appeared not to have affected the surface of the mold. The characteristic self-lubricating, non-adherent qualities of Kirksite to phenolic and cresylic acid resins was again observed. In applications where a highly polished surface might be desired on a part, such a surface could be maintained by the application of a flash coating of hard chromium plate on the Kirksite. Such a coating would impart abrasion resistance against scratching and make the mold inert to some of the more corrosive resins.

As far as laminated plastic materials are concerned, the most satisfactory flow characteristics were obtained using a cresylic acid saturated Kraft paper which had undergone a special treatment so that the resulting product was creped in two directions on the sheet of paper, thus providing elongation and flow in both directions. This material is known as Resin X-crepe paper and was furnished by Cincinnati Industries, Inc. Caution had to be exercised to avoid excessive curing as a result of too lengthy a breathing and plasticising period. It will be seen from Fig. 8 that all evidence of both folding and tearing are absent in the laminated-molded part.

All other combinations tried developed serious wrinkles or tore the filler material. These included army boot duck impregnated with phenolic resin; high strength Mischerlich sulphite oriented paper, with phenolic resin; 100 per cent cotton paper mat without resin and Buna-S cellular board, also without resin.

The study also revealed that plastic assemblies can be cemented from component laminated parts using Resin-X furfural resin and a catalyst without heat but with contact pressure, provided by lead shot bags. The door section shown in Fig. 8 was bonded to a Formica phenolic laminate in this manner after the latter had been heated to 475 deg. for 1½ min. to replasticize it. Resin-X is a synthetic resin developed by John Delmonte, technical director of the Plastic Industries Technical Institute.

Liquid Steel Temperature in Basic Open Hearth Furnaces

AT the 1944 annual meeting of the British Iron and Steel Institute, D. Manterfield reported on the results of temperature surveys on the larger type of basic open hearth furnace.

Temperatures were taken with the Schofield-Grace quick immersion pyrometer, using a portable potentiometer for measurement. Readings were taken at various positions in the vertical and horizontal plane. A point in the center of the bath at a depth of 9 in. in the steel is the standard position for measurement. The mean deviation from this figure at all the positions explored was 9.9 deg. F. From the studies made, it was concluded that a single temperature measured at the standard position can be taken as representative of the bath as a whole. Uniformity of bath temperature is governed by its activity.

From a series of typical time-temperature diagrams together with details of furnace additions, it was seen that such additions caused only a very temporary depression of temperature. At the beginning of the refining period an average superheat (over the melting point) of 72 deg. F. prevails, rising to 126 deg. to 180 deg. F. at the going-on stage.

Slag and metal temperatures were also taken, the metal at the standard depth and the slag at a depth of 2 in. The results indicated that during the reaction period the activity equalizes the temperature of both the slag and the metal. In the final stages of refining a greater temperature difference was found. Slag temperatures were higher than that of the metal by 2 deg. to 84 deg. F., depending upon the condition of the bath and the prevailing steel temperature.

Fluoroscopy and Radiography

. . . Companies manufacturing die castings, molded plastic parts and assemblies, foundries that cast large quantities of small parts, producers of aircraft and other manufacturers who require mass X-ray inspection will find the combination unit described herein an efficient answer to many inspection problems.

REALIZING that radiographic inspection had to be speeded up to keep pace with production, automatic, conveyor-fed X-ray machines suitable for mass inspection have been found indispensable in many plants. This is particularly true of aircraft plants, foundries casting material under contract to producers of war material, and to manufacturers of assemblies requiring X-ray inspection in accordance with standard specifications.

The engineering features for more rapid methods of X-ray inspecting a product have, up to the present time, been devoted to radiography. Most recently it was felt that fluoroscopy could be supplemented to radiography. There were various reasons behind this thought. Fluoroscopy is more rapid than radiography, the tremendous demand for radiographic film has been making it rather difficult for manufacturers to meet the demands of all customers, and the training of personnel to meet the exacting demands of X-ray inspection has become quite a problem.

Engineers at once began to devote practically their entire time to developing a fluoroscopic machine, whose design, with the aid of a small-focus X-ray tube would make possible a sensitivity in the detection of discontinuities that would meet with the approval of the originators of specifications governing the various products.

With the hopes of aiding inspection still further, fluoroscopic machines have, within recent months been developed to take their place in the inspection line. When handling most light alloys, these units will provide an inspection sensitivity of between 3 and 7 per cent. This is truly a remarkable feature when it is considered that, even for Class I castings, existing specifications demand a 2 per cent sensitivity for aluminum and a 3 per cent for magnesium, when inspected *radiographically*.

There are of course many variables which enter the fluoroscopic examination of a product which had to be given serious consideration. Some of the variables which affect sensitivity or in this instance what the eye can perceive make it a rather difficult problem to assert the exact sensitivity unless all factors controlling the image are known.

Operators who are not acquainted with a casting will take longer and perhaps be unable to detect a defect that an experienced operator would pick up with little difficulty. Sensitivity of the method might be stated as dependent on the operator's vision, the size, shape and thickness of a casting, and the speed of inspection. For the inexperienced operator, inspection at first must be slow and deliberate,

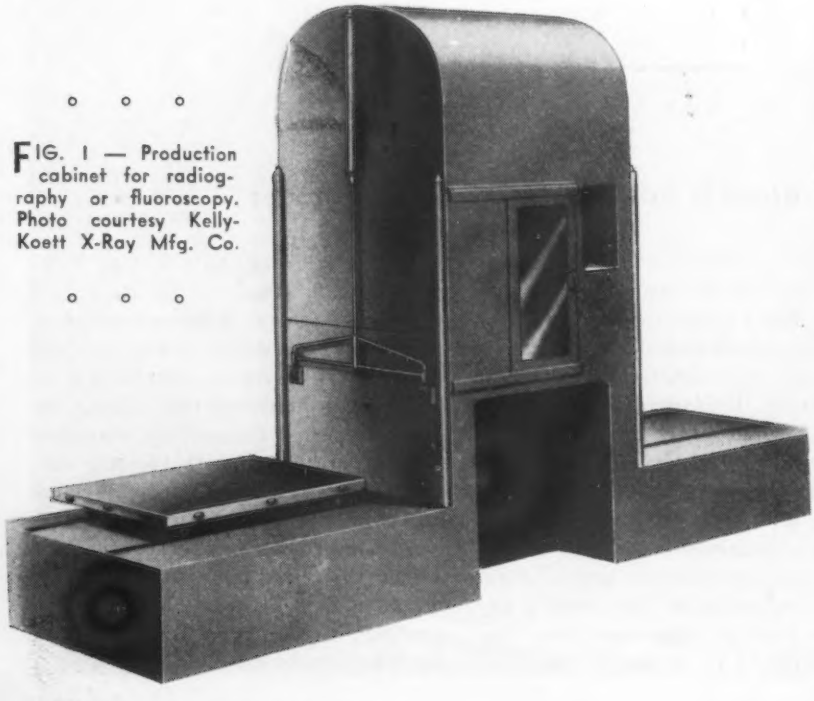
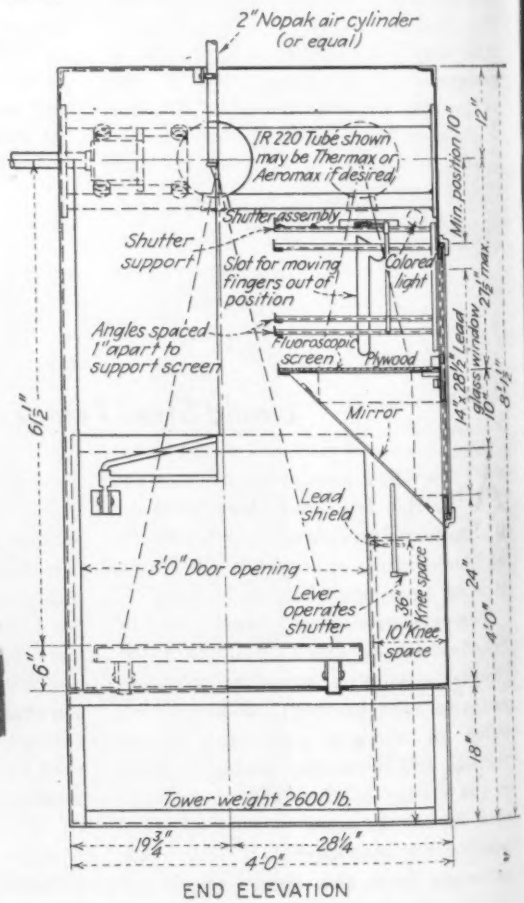


FIG. 1 — Production cabinet for radiography or fluoroscopy. Photo courtesy Kelly-Koett X-Ray Mfg. Co.



END ELEVATION

Combined in New Unit . . .

By ROBERT TAYLOR
Consulting Industrial Radiologist, Pullman, Wash.

until he is acquainted with the material being inspected and accustomed to his surroundings. Any glare from the fluorescent screen will obviously reduce the sensitivity considerably and adequate lead shutters must be utilized to confine the beam of X-ray to cover only the area being inspected. This, of course, has been accomplished in the design of the available machines now ready for use.

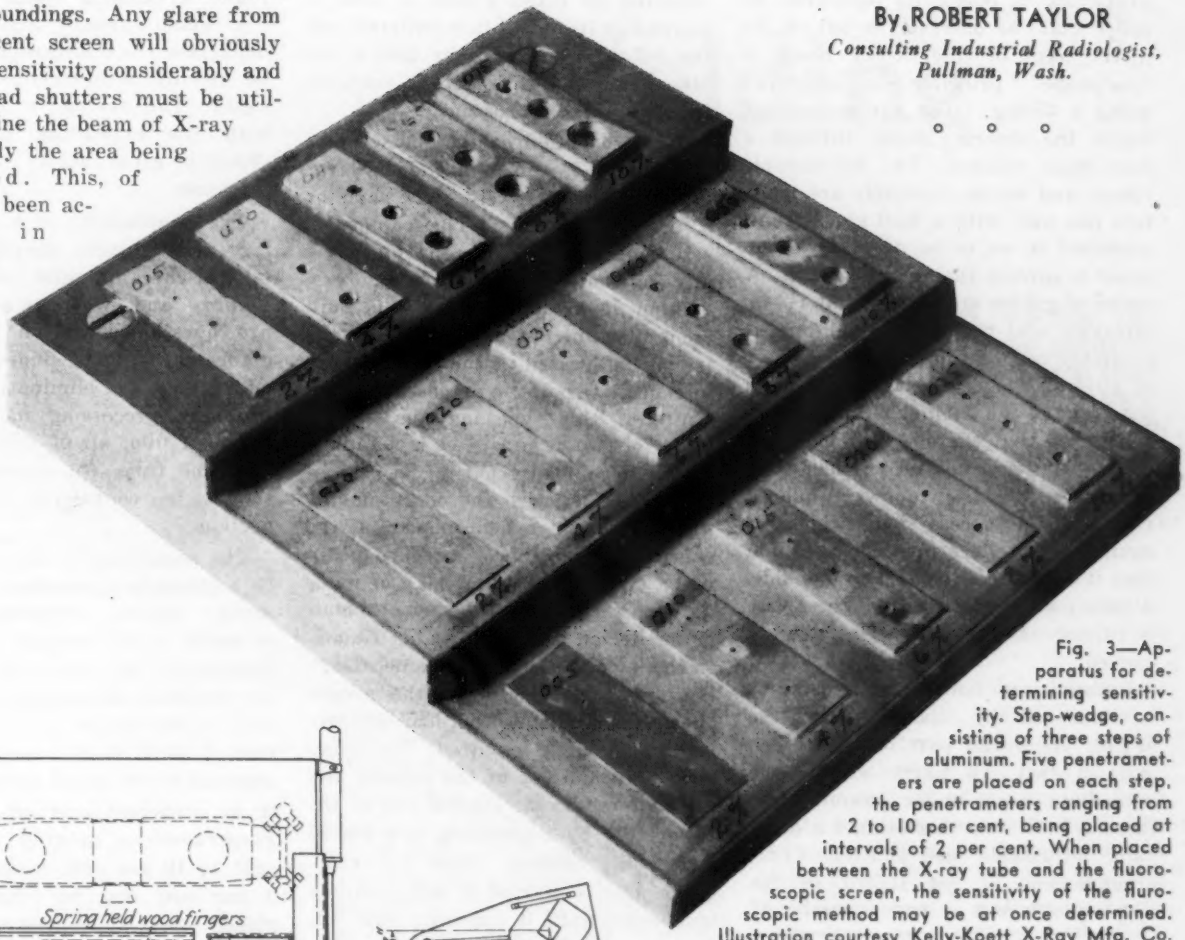
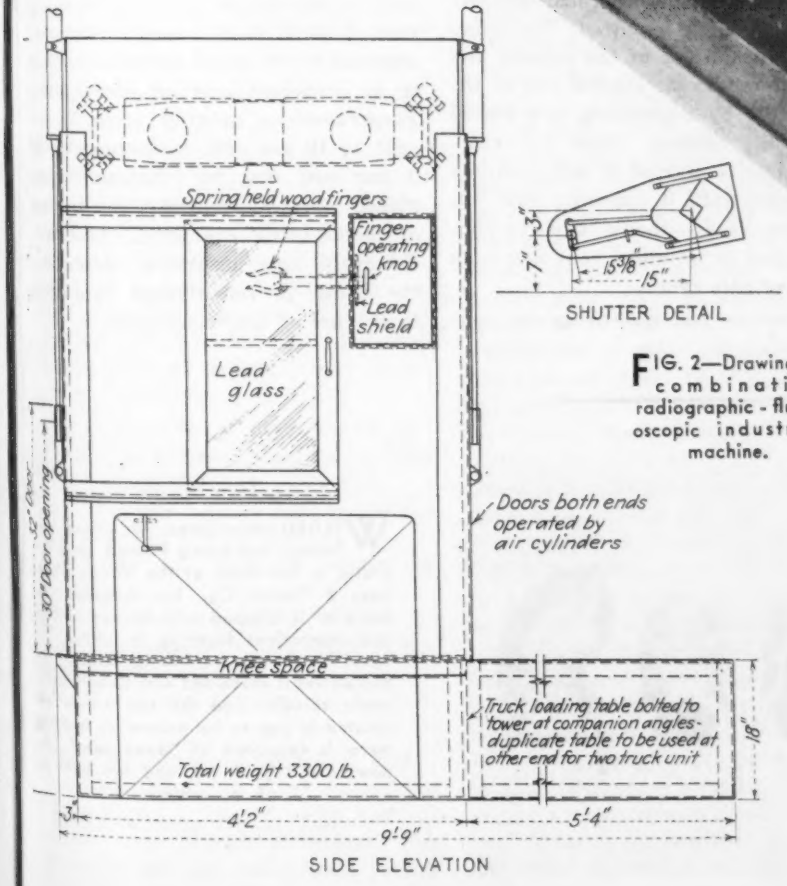


Fig. 3—Apparatus for determining sensitivity. Step-wedge, consisting of three steps of aluminum. Five penetrameters are placed on each step, the penetrameters ranging from 2 to 10 per cent, being placed at intervals of 2 per cent. When placed between the X-ray tube and the fluoroscopic screen, the sensitivity of the fluroscopic method may be at once determined. Illustration courtesy Kelly-Koett X-Ray Mfg. Co.



SHUTTER DETAIL

FIG. 2—Drawing of combination radiographic - fluoroscopic industrial machine.

Whereas it was quite a problem to initiate the design and construction of an industrial fluoroscopic machine suitable to the demands of specifications, it has been even more of a problem to design a machine wherein the combining of radiographic inspection with fluoroscopic inspection afforded a producer or foundryman access to either method by merely throwing a switch.

The idea of combining radiography and fluoroscopy in one cabinet is entirely logical. Even though recent fluoroscopic improvements permit a sensitivity of better than 5 per cent, fluoroscopy is not recommended as a substitute for radiography, but rather as a supplement to it. There is always

the work which requires a higher degree of sensitivity than has so far been worked out fluoroscopically, and there will always be certain requirements for film records. However, the combining of both certainly should speed up this type of inspection.

In explanation, the cabinet pictured in Fig. 1 is an all-welded steel structure with the fluoroscopic chamber adequately lined with lead suitable for protection of operating personnel. In order that the observer be out of the direct path of the X-ray beam, a "periscope" principle is employed using a 45-deg. front surface mirror which the observer views through a lead glass window. The fluoroscopic screen and mirror assembly are made into one unit with a lead glass front, gasketed so as to be dust and fume proof to protect the mirror surface. A series of guides are arranged at 1-2 in. intervals and the screen and mirror assembly can rest on any chosen pair of guides. The lead glass window on the front of the cabinet is made large enough so that the operator can look through it regardless of the height of the screen. This window is placed right in the access door which is mounted on rollers in such a fashion that it can be readily slid to one side. A safety switch insures that the X-ray is turned off as soon as the door is opened.

Recognizing how much visibility is improved by masking out the bright, uncovered part of the screen and, in fact, all parts outside the immediate area under examination, there is built into this cabinet a manually adjustable lead shutter. (This arrangement is not shown in the illustrations, but is now available.)*

* *The manually adjustable lead shutter is shown in the drawing.*

A knee space is provided in the combination radiographic and fluoroscopic cabinet so the operator may sit comfortable over long periods of time. A time of two hours should be considered maximum for operators doing fluoroscopic work, after which a relief operator should take over. The opening to the upper right of the access door permits a pair of tongs to be inserted for handling small parts and rotating them slowly.

In this cabinet the X-ray tube is mounted on roller guides so that at one end of its travel it is centered over the dolly for radiography and at the other end of its travel is over the center of the fluoroscope.

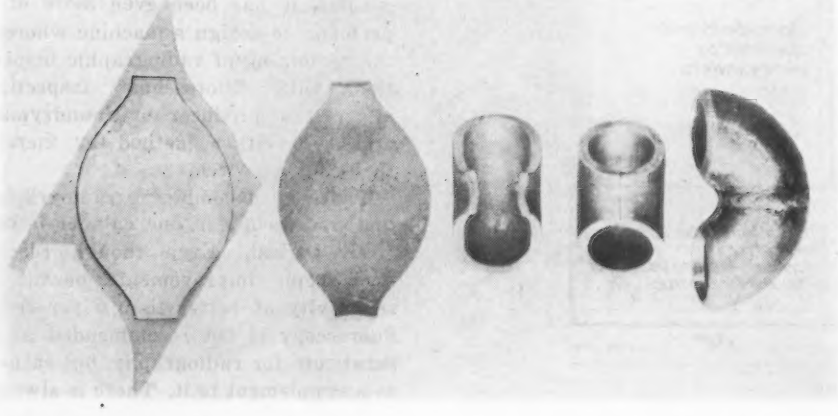
The production cabinet makes possible the X-ray examination of large quantities of relatively small parts on a production basis. The cabinet is self contained and can be placed in any convenient location in the production department. Since it is built along the lines of a conveyor system it may be located at the end or at an intermediate point in an assembly line. Units of this type may be had in either of two designs. One is manually operated, the dollys moving in and out of the cabinet with the doors moving up or down in synchronism and the energy to the tube controlled manually, or, the entire unit may be made automatic by adopting a synchronous motor driven series of cycling timers. In the latter case, all that is necessary is to set the timers for the proper operating cycle and then load and unload the dollys as required. The dollys move into and out of the cabinet and are centered to the central ray of the X-ray tube by a centering stop placed within the cabinet. Once the automatic unit is started it will continue to operate until it has been shut off. As many as five thousand parts may be handled in an eight hour day with a unit of this type.

Companies manufacturing die castings, molded plastic parts and assemblies, foundries that cast large quantities of small parts, producers of aircraft and other manufacturers who require mass X-ray inspection will find a combination unit such as that described an efficient answer to their inspection problems.

From the writer's own experiences in mass inspection X-ray laboratories it is believed that the fluoroscope has found a valuable place in industry. For certain types of castings and other materials, the fluoroscopic method can be readily supplemented to radiography. The saving in film together with the expediting of inspection should be great factors in favor of the machines.

The adaptability of a unit combining these features should aid greatly in spot-checking pilot casting in the foundry and, where machined parts are questioned by an inspector, a glance through the fluoroscope should offer a means of eliminating the radiographing, processing and interpretating of a film, all of which take considerable time. An economical factor should be considered in this connection.

The sensitivity of the process must be accurately determined in order to avoid unjust criticism, and is essential in determining the value of fluoroscopy to industrial inspection. For accurate determination of sensitivity a step wedge, covering the thickness of metal to be inspected and constructed of the same material as that to be inspected may be constructed. Penetrameters ranging from 2 per cent to 10 per cent in increments of 2 per cent may be constructed and placed over appropriate thicknesses of metal being examined. This will definitely and accurately determine the range of sensitivities applicable to the use of the fluoroscope.



o o o

WELDED return bends for special ship fittings are being formed from flat plates in five steps at the Weber Showcase & Fixture Co., Los Angeles. The material is blanked and formed cold in four operations from 1/4 in. plate. The bevel for the circumferential weld of the two halves is machined with double automatic spindles and the two halves are rotated in jigs to be welded so that the metal is deposited all "down hand". Elbows are 1 1/2 in. i.d. and are bent on 3 in. centers.

Photo courtesy Hobart Brothers Co.

o o o

Flash-Butt Welding

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. . . Many advances have been made in flash-butt welding and when the workpieces are properly designed and the weld properly made, various tests show remarkable results. In this, the second of a three-part article the authors illustrate good and poor designing practice and make recommendations which are predicated on creating balanced sections in the vicinity of the weld. In the concluding article the technique for controlling metallurgical changes at the weld line will be presented.

IT is recognized that it would be very desirable to express numerically all of the relationships between the factors involved in the flash-butt welding process as precise values. It is also recognized that the factors involved in the flash-butt welding process can no more be assigned precise values than can the factors involved in any other metal working process, and for the same reason that the physical characteristics of the metals to be welded cannot be given precise values, but have a normal percentage of deviation from the average.

Designing for Flash-Butt Welding

The flash-butt welding of most of the materials welded is not so sensitive that deviation of plus or minus approximately 5 per cent from the numerical values of the process factors will cause any objectionable variations in the tests applied to the welds. Since any numerical values given can only cover the majority of applications, it should be kept in mind that modifications of technique may be required depending upon:

1—The degree of precision of mechanical alinement required in the welded assembly

2—Whether furnace heat-treatment after welding will be used

3—Type of welding equipment available

4—Required production

5—Weld quality necessitated by the application

6—Variations in material properties.

The recommended values of design variables given are based on making the highest quality of welds such as required for aircraft structures. For other applications where weld quality need not be as high as that required for aircraft structures, economic considerations may dictate modifications of these recommendations, such as eliminating starting bevels, etc.

General Design Considerations

While this process of resistance welding is justifiably termed flash-butt welding, it is not possible to indiscriminately flash-butt weld all combinations of sections. Since the same welding current and upsetting force are applied to both pieces to be joined, the plastic bonding conditions in each piece must be approximately equal.

Examples of good and poor design practices are shown by Figs. 8 and 9, and are based on both pieces to be joined being the same material. Modifications are in order if the materials are of different analyses, which may affect ease of flashing and compressive strength at elevated temperature. The good design practices indicated by Fig. 8 are predicated on creating equivalent sections in the vicinity of the weld. It should be noted that the sectional unbalances indicated by Fig. 9 are determined by design considerations and are usually sufficiently large to absorb the relatively small variations due to machining tolerances and alinement tolerances during welding. In some applications the section unbalance as shown by Fig. 9-A is purposely made to allow for normal misalinement of the pieces to be welded in production.

For example, if a tube 1.500 in. o.d. with an 0.062 in. wall thickness is welded to a short forging with a joint design similar to Fig 8, B-2, the forging wall may be approximately 0.006 in. thicker than the tubing wall, and the excess thickness equally divided as shown by Fig. 9-A. After the weld is made, the part may be put in a lathe and the forging surface be turned down to exactly the diameter of the tubing, and any normal tolerances of misalinement or original part tolerances will thereby be corrected. If the upset metal need not be entirely removed, but partially retained as a slight reinforcement, then this above procedure need not be followed. Tables I and II show recommended values of maximum joint length vs. steel thickness and maximum diameters of tubing vs. wall thickness.

In the same manner, Tables III and IV show recommended values which will give best results for the large majority of applications. As explained before, certain factors may force modification of the precise values.

Whenever the sheet thickness, tube wall thickness, or bar diameters shown in Tables III and IV exceed 3/16 in. one of the parts to be welded should be beveled. This is particu-

larly true when the welder is operating fully automatically and no dual voltage control is used to assist in starting the flashing action. The beveled edge need not be precise nor smooth; a cast, gas-cut or forged bevel is satisfactory.

Referring to dimension *S* in Tables III and IV, this recommended minimum clamping area should be maintained for a combination of reasons such as:

1—To obtain sufficient bearing length on the part to be welded to maintain final weld alinement

2—To obtain sufficient contact area between die and part to conduct the welding currrent without damaging either the contacting face of the work or the die

3—To use efficiently reduced unit pressure on copper-base alloy dies as to prevent mechanical deforming of the dies.

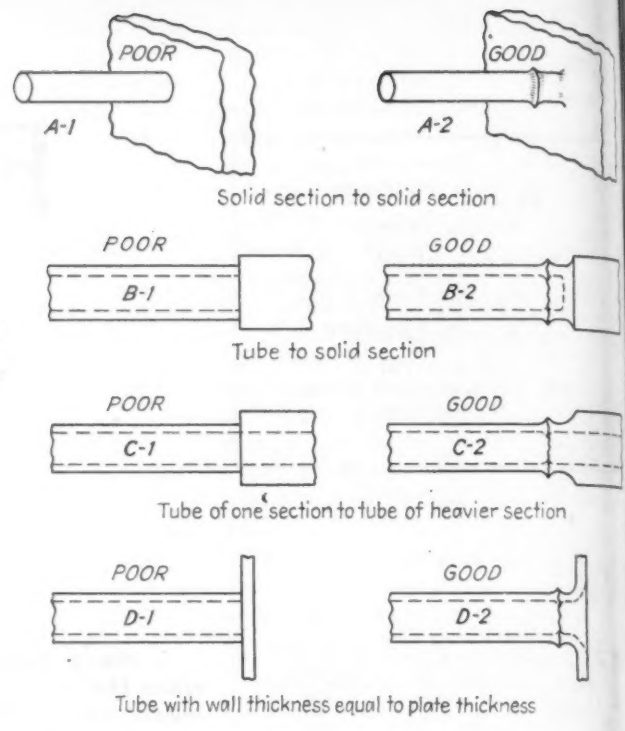


FIG. 8—Examples of good and poor joint designs for flash-butt welding.

Welding Tolerances

Tolerances of axial alinement and overall length are much better than can be obtained consistently by any other welding process. Misalinement due to distortion by the welding heat is practically nil.

The accuracy which can be obtained in production will be influenced by:

1—Tolerances in the parts before welding

2—Rigidity and precision of the welding machine and fixtures

3—Maintenance given welding electrodes to control normal electrode wear

4—Care used in loading work in welder

To illustrate the numerical values of such tolerances, an adequately designed and maintained welder can weld centerless ground ⅜ in. diameter valve stems to production tolerances of 0.006 in. total indicated "run-out" at the weld, which means 0.003 in. eccentricity and a maximum variation in length of 0.005 in. Such production tolerances are obtained because the parts are centerless ground to a high degree of accuracy before welding; special precision welding machines and fixtures are designed for the application, and careful attention given to electrode maintenance and work loading. Large 6 in. diameter tubing with ¾ in. thick wall, rough machined, can be welded in production to between 1/64 and 1/32 in. concentricity at the weld, and a maximum variation in length of 1/16 to 3/32 in. Typical examples of precision welded parts are shown in Fig. 10.

Removal of Flash and Upset

Common practices for the removal of flash and upset vary from complete removal to no removal depending on the application. For example, welded fence posts have no material removed; welded steel mill strip, hydraulic cylinders, drills, shells, valves, etc., have all of the flash and upset removed; while motor magnet rings, railroad rails, etc., may have only sufficient material removed to eliminate mechanical interferences by the increased section. The majority of aircraft tubing has no material removed from inside the tubes because not only is the inner material inaccessible, but there is no criticism from an appearance standpoint. The other material is ground down to leave only solid metal as a reinforcing ridge approximately 0.010 in. high around the tubing. The material is not entirely ground off because of the possibility of damaging the tube wall by the rough grinding operation.

The flash and upset material, both loose and solid, is removed by a variety of methods, depending on the application and material welded. Materials which tend to air harden when welded must usually have the flash and upset material removed by grinding. On some sections, hand chipping the red-hot flash and upset material with an air chisel is practiced. In other cases, the material is removed by machining with a lathe, boring mill, broach, reamer, shaper, drill,

TABLE I

Recommended Maximum Joint Length for Flash-Butt Welding Various Thicknesses of Flat Sheet

Sheet Thickness, In.	Max. Joining Dia., In.
0.010	1.00
0.020	5.00
0.030	10.00
0.040	15.00
0.050	20.00
0.060	25.00
0.080	35.00
0.100	45.00
0.125	57.00
0.187	88.00

TABLE II

Recommended Maximum Diameters for Flash-Butt Welding Tubing of Various Wall Thicknesses

Wall Thickness, In.	Max. Tub-Length, In.
0.020	0.50
0.030	0.75
0.050	1.25
0.062	1.50
0.080	2.00
0.100	3.00
0.125	4.00
0.187	6.00
0.250	9.00
0.375	15.00
0.500	20.00

No inference should be drawn that for a given sheet thickness or a given wall thickness, the weld length or tubing diameter cannot be increased. These recommended maximums do not include laboratory procedure or an unusually high degree of electrode maintenance, etc., in production. They are simply a statement of recommended practices for use with "run-of-the-mill" parts preparation, die and welder maintenance, shifts in operator personnel, etc.

shear blade, trimming die, etc., depending upon the geometry of the work and the finish desired.

Surface Preparation of the Work

The quality of welds made by the flash-butt welding process is influenced less by poor surface conditions than the quality of welds made by any other resistance welding process. This is so because the welding heat is not appreciably influenced by the contact between the dies and the work, nor is the current density as high as that used in other processes. The work preferably should be clean and free from excessive grease and oil, scale, rust, paint or other foreign substances which would interfere with the conduction of current from the electrodes. A wide variation of surface conditions is possible. Heavy forgings or castings with grit blasted surfaces are satisfactory for that type of application. When welding stainless steel the work surfaces must be quite clean and electrodes should be made of copper, or high conductivity copper alloy, and well maintained. A current density is used which is sufficiently low to prevent localized "burning" or "checking" of the work pieces.

Work Back-Up and Locating Fixtures

Back-up and locating fixtures of necessity must be designed to handle each specific application. In the design of back-up fixtures in particular, care must be taken to design them with sufficient strength to withstand the upsetting force. Designs of back-up fixures which will have an adequate factor of safety should be based on the following upset forces for each square inch of welded cross-sectional area.

1—Low forging strength steels—10,000 lb. per sq. in., welded area

2—Medium forging strength steels—15,000 lb. per sq. in., welded area

3—High forging strength steels—25,000 lb. per sq. in., welded area

4—Extra high forging strength steels—35,000 lb. per sq. in. and upward, welded area.

Physical Testing of Flash-Butt Welds

In flash-butt welding no metal is added to the weld as in arc or gas welding. Hence, given a sound weld, there is theoretically little or no change in chemical composition at the weld. It is true that the fiber of the steel is more or less diverted from its normal flow by the upsetting action and this may have some effect on physical properties. The metallographic structure at the weld and in the heat-affected zone is also altered by the heat of welding, but theoretically a uniform treatment should restore homogeneity to the specimen. In the "as-welded" condition in steel, the weld and part of the heat-affected zone become hardened due to the rapid quenching of the heated metal through the rapid conduction of heat away from the weld by the adjacent metal of much lower temperature. Even low carbon steel becomes hardened to a certain extent. If the parent metal is annealed and soft, it will fail before the weld in a tensile test; conversely, its ductility will be higher than that of the weld. If the parent metal is hard, there will be an area in the heat-affected zone which, by virtue of the welding heat, will be softer in comparison to both the weld and the parent metal. This soft area will be lowest in strength and highest in ductility.

Tensile testing: Tensile tests carried out on "as-welded" specimens properly made will either break outside the weld or in the heat-affected zone for the reasons given in the above paragraph. Very often yielding will occur on both sides of the weld before final fracture takes place. As stated above, the fracture will occur in the parent metal if it is soft, or in an area softened by the heat of welding if the parent metal is hard.

When flash-welded specimens are uniformly heat treated after welding, the strength of the weld is as high as that of the parent metal. At all heat-treated strengths, the breaks occur at random, i. e., either in the weld or in the parent metal. When fracture occurs in the weld, it is always accompanied by lowered ductility, even in the absence of any inclusions. Two factors may influence this phenomenon. One is that the steel fiber in the two pieces has been distorted in the vicinity of the weld by the upsetting action. At the weld line, then, the fiber is practically transverse, and would be expected to lose ductility in a tensile test. The other factor influencing this loss in ductility concerns itself with the loss of carbon at the flashing surfaces during welding. Examination of welds in the "as-welded" condition indicates a narrow decarburized zone at the weld line. Normal heat treating practice may not overcome this differential in carbon content, with the result that the tensile fracture may occur at the weld line. A proper homogenizing treatment (high temperature treatment) may be necessary before quenching and tempering in the case of certain steels, particularly alloy steels, in order to rid the weld structure completely of this decarburized zone. Breakage in the weld appears to oc-

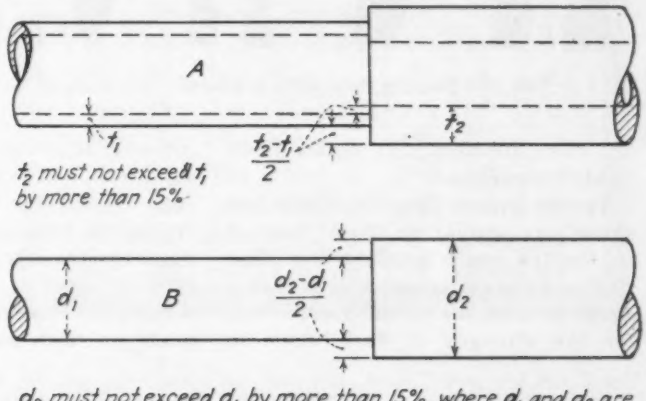
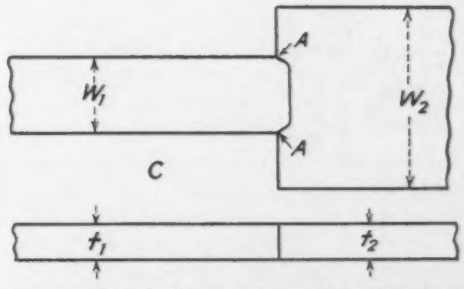


FIG. 9 — Maximum sectional unbalance of joint designs for flash-butt welding.



An exception to the requirements of B above involves the conditions of W_2 being more than 10% greater than W_1, t_2 being equal to or no greater than 15% in excess of t_1, and the recognition of low weld quality at A

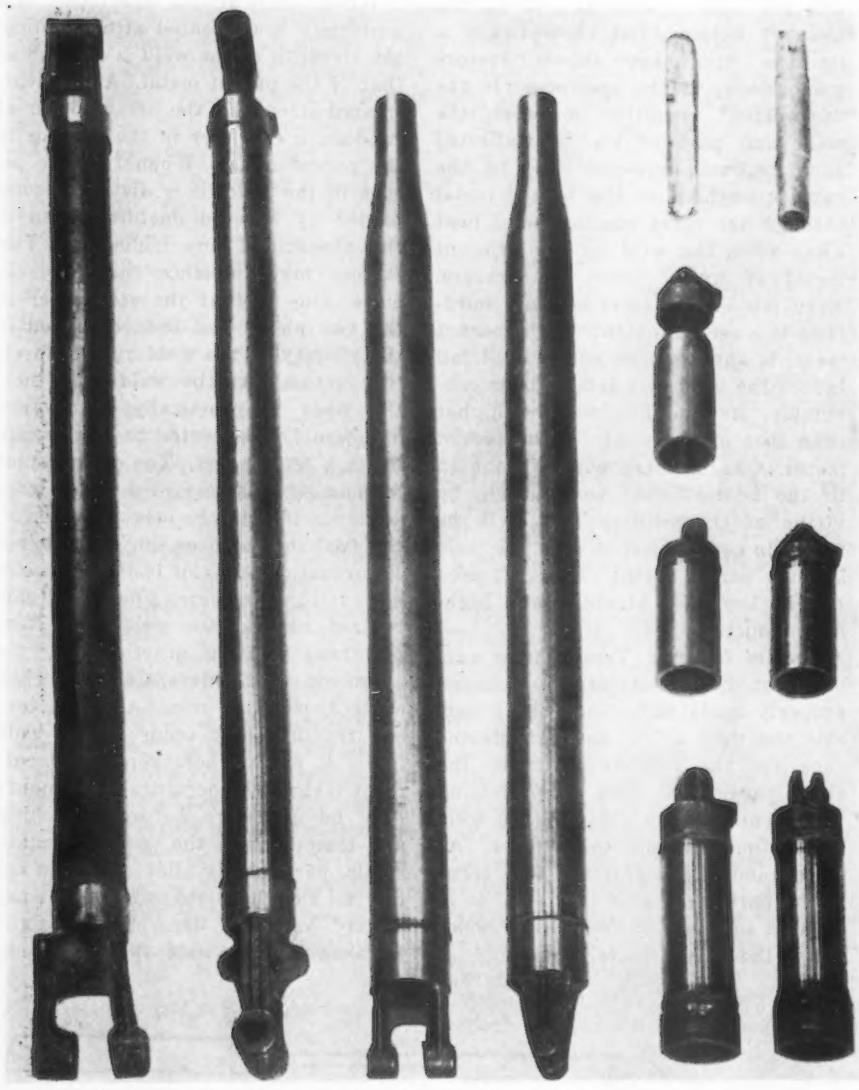


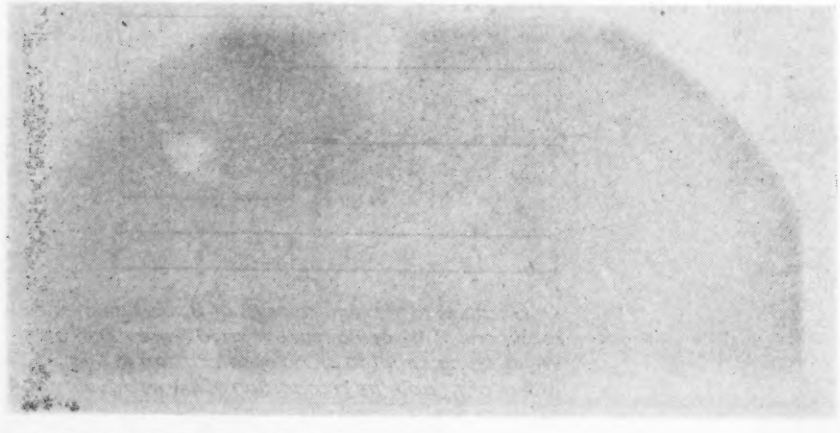
FIG. 10—Precision flash welds in aircraft parts made of SAE X-4130 steel.

cur more frequently at higher heat-treated strengths.

Tensile impact: Tensile impact test values are similar to those obtained in slow or static tensile tests. That slow and impact tensile values should agree to such an extent speaks well for the strength of flash welds in general. It is interesting to note that the break in a tensile impact test occurs without ductility and contains a crystalline appearing fracture, as opposed to the fibrous fracture of the slow tensile test.

Fatigue: Fatigue tests have been made on flash welds in low carbon steel rods up to 1¼ in. diameter. The specimens were rotated at 1850 r.p.m. and were loaded at the center through a ball bearing. Endurance limits were determined in the following manner: the specimen was subjected to two million cycles of load reversal at a stress lower than the expected endurance limit. The stress was then increased in steps of 1400 lb. per sq. in. and two million cycles of load reversal were imposed at each step, until fracture occurred. The highest value of stress at which the specimen withstood two million cycles without fracture was taken as the endurance limit. It was found that specimens of the parent metal, unwelded, had endurance limits of 23,400 lb. per sq. in. in the as-rolled condition and 28,100 lb. per sq. in., in the polished condition. Flash welded specimens all broke outside the weld. When the weld was merely dressed, leaving a little of the upset metal, the endurance limit was the same as that of the as-rolled unwelded specimen, namely 23,400 lb. per sq. in. When the welded specimens had all the upset material at the weld removed and were polished, the endurance limit varied from 23,700 to 26,300 lb. per sq. in., which was somewhat lower than the polished unwelded stock. That the fractures occurred outside the weld, however, is an indication that the thermal effect of the welding, rather than the line of fusion of the weld itself, produced the lower values. The surface preparation of the specimen has more effect on the endurance limit in fatigue than does the presence of a weld in this material.

FIG. 11—Radiographic test of section ½ in. thick which contains a poor flash-butt weld in 5 in. diameter low carbon steel.



Bend test: In the bend test, the bar is supported near its two ends and pressure is applied at the weld to bend the piece. In the case of "as-welded" low carbon steels, bending through 180 deg. without fracture is the rule, since the weld is only slightly harder than the parent metal. More hardenable steels in the "as-welded" condition will fracture in some part of the brittle heat-affected zone, demonstrating the lack of ductility in that location. Heat-treated welds follow the same rule in the bend test as in the tensile test, i. e., if fracture occurs in the weld, a lowering of ductility is apparent.

One disadvantage of the bend test as applied to flash welding is the fact that only the outer fibers of the bar are stressed in tension. If, then, a weld defect is present in the outer fibers, this defect will be seen when the bar breaks. A defect on the inside of the bend, which is in compression, would not be detected and the

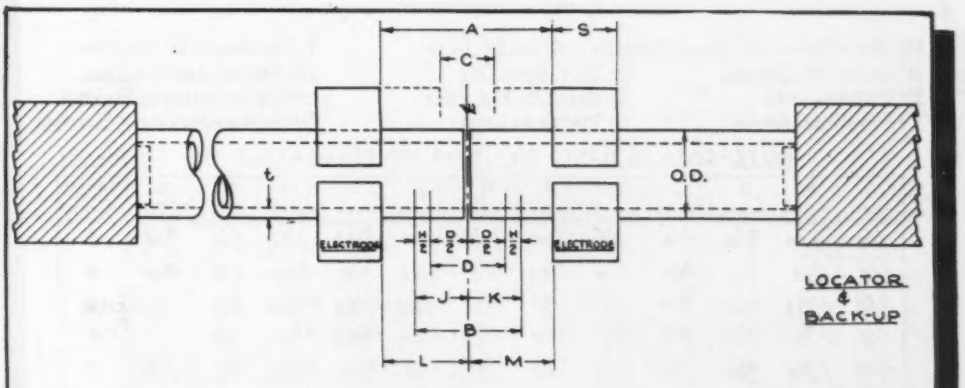
weld would be considered sound, although in reality it is not. However, if the section welded is circular, the weld may be rotated in the bending jig so that all outer fibers can be stressed in tension.

Cupping test: The Olsen cupping test is applied only to strip and sheet. In hardenable steels, the hardening of the weld zone causes cracks to appear at right angles to the weld during testing at somewhat lower test values than obtained in the parent metal with no welds. In 0.24 per cent carbon steel the welded specimen might test around 550 Olsen (0.550 in. as measured by the gage) while a specimen of parent metal might test 610 Olsen, when using a ⅞ in. diameter ball and 1½ in. die in the tester. If the break occurs at the center of the weld at low test values and with the fracture parallel to the line of fusion, the weld is defective. It might be noted here that it is necessary that the surface finish of the material used for the cupping test be very smooth. If it is not smooth or if the upset is not trimmed properly, low test values will result.

Corrosion resistance: Since no external metal is added to a flash weld, as is the case in arc or acetylene welding or in brazing, lowering of corrosion resistance due to the addition of weld metal does not enter into the picture. Hence flash welded carbon or common alloy steels will exhibit a high degree of corrosion resistance.

It is common knowledge that a stainless steel which has been heated in the range of temperatures from approximately 900 to 1500 deg. F. will show the phenomenon of carbide precipitation at the grain boundaries. The formation of carbides, particularly chromium carbides, deprives the areas adjacent to the grain boundaries of their normal corrosion resistance. In any weld made in a stainless steel, flash welds included, there will be some point back of the weld which will be subjected to the dangerous temperature range, and which will lack corrosion resistance. This can be remedied by subsequent heating to 1800-2000 deg. F., followed by rapid cooling. If the stainless steel, however, contains columbium or titanium in proper amounts, there is no loss of corrosion resistance, since columbium or titanium carbides form in preference to chromium, leaving the chromium in solid solution with the iron.

Magnetic testing: In magnetic testing, current is passed through the part to be tested either directly or by means of an energized coil wound around the part. While the part is magnetized, magnetic powder (magnetic iron oxide) is sprinkled on it. The powder distributes itself in a pattern indicative of the pattern of the "leakage flux" and so gives an indication of defects. Best results are obtained when the lines of flux are at right angles to the line of defect. For example, to examine for longitudinal defects in a bar, current must be passed through the bar from end to end, so that the magnetic flux lines pass around the bar. To test for transverse defects, the magnetic flux lines must pass through the bar longitudinally. If the magnetic powder is dusted on while the current is flowing, the process is called the continuous method; if applied while there is only residual magnetism in the specimen, it is called the residual method. In the dry method, the powder is dusted on the part. In the wet method, the part is submerged in, or flushed with, a suspension of the magnetic powder in kerosene. The wet method is widely adapted to smooth surfaces, as it shows to great advantage small inclusions and discontinuities. For rough surfaces the dry method is preferred. In the latest development of magnetic inspection the magnetic powder contains a fluorescent material. The magnetized parts are examined under "black" or "near ultra-violet" light. Indications of defects stand out



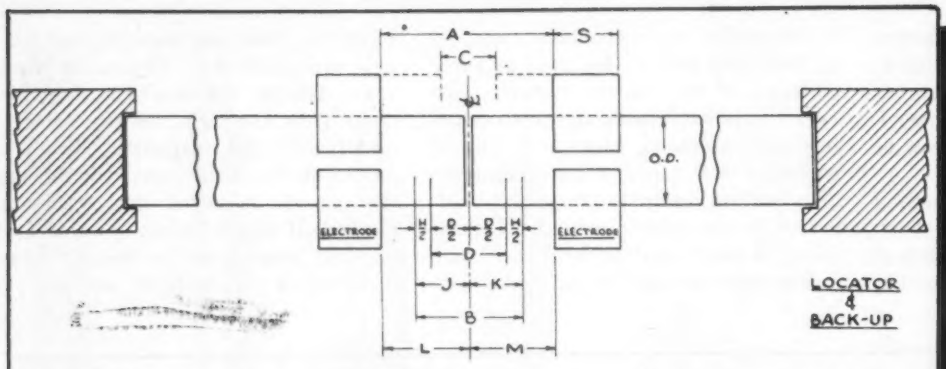
t = Tube Wall Or Sheet Thickness
A = Initial Die Opening
B = Material Lost
C = Final Die Opening
D = Total Burn Off
½ = Burn Off Per Piece
H = Material Upset
½ = Material Upset Per Piece
J-K = Material Lost Per Piece
L-M = Initial Extension Per Piece
O.D. = Outside Dia. Of Tubing
S = Min. Necessary Lgth. Of Electrode

NOTE:- DATA IS BASED ON USING NO PREHEATING — CONTACT

t INCHES	A INCHES	B INCHES	C INCHES	D INCHES	½ INCHES	H INCHES	½ INCHES	J-K INCHES	L-M INCHES	O.D. INCHES	S WITH LOCATOR	S WITHOUT LOCATOR	FLASHING TIME SECONDS
3/64	5/16	3/16	1/8	1/8	1/16	1/16	1/32	3/32	5/32	3/8	3/8	1	3
1/16	5/8	3/8	1/4	5/16	5/32	1/16	1/32	3/16	5/16	1/2	3/8	1	4
3/32	29/32	17/32	3/8	7/16	7/32	3/32	3/64	17/64	23/64	3/4	1/2	1½	5
1/8	1 1/8	5/8	1/2	1/2	1/4	1/8	1/16	5/16	9/16	1	3/4	2	6
5/32	1 1/4	11/16	9/16	9/16	9/32	1/8	1/16	11/32	5/8	1½	1	2½	7
3/16	1 5/32	25/32	11/16	5/8	5/16	5/32	5/64	23/64	47/64	2	1¼	3	8
1/4	1 11/16	7/8	13/16	11/16	11/32	3/16	3/32	7/16	27/32	2½	1½	3	10
3/8	1 3/32	21/32	1	3/4	3/8	7/32	7/64	31/64	63/64	3	1¾	USE LOCATOR	13
1/2	2 3/16	1 1/16	1 1/8	13/16	13/32	1/4	1/8	17/32	1 3/32	4	2¼	USE LOCATOR	15
5/8	2 13/32	1 5/32	1 5/16	7/8	7/16	9/32	9/64	31/64	1 15/64	5	2¾	USE LOCATOR	18
3/4	2 13/16	1 5/16	1½	1	½	5/16	5/32	21/32	1 13/32	6	3	USE LOCATOR	20
1	3	1 5/16	1 11/16	1	½	5/16	5/32	21/32	1½	8	4	USE LOCATOR	24

TABLE III

Material Allowances for Flash-Butt Welding Low Carbon and Low Alloy Steel Tubing and Flat Sheet the Same Thickness as the Tubing Wall.



O.D. = Dia. Of Rounds Or Minimum Dimension Of Other Sections
A = Initial Die Opening
B = Material Lost
C = Final Die Opening
D = Total Burn Off
P/2 = Burn Off Per Piece
H = Material Upset
H/2 = Material Upset Per Piece
J-K = Material Lost Per Piece
L-M = Initial Extension Per Piece
S = Min. Necessary Lgth. Of Electrode

NOTE:- DATA IS BASED ON USING NO PREHEATING — CONTACT

O.D. INCHES	A INCHES	B INCHES	C INCHES	D INCHES	P/2 INCHES	H INCHES	H/2 INCHES	J-K INCHES	L-M INCHES	S WITH LOCATOR	S WITHOUT LOCATOR	FLASHING TIME SECONDS
1/8	7/16	3/16	1/4	1/8	1/16	1/16	1/32	3/32	7/32	1/4	3/4	3
1/4	5/8	1/4	3/8	3/16	3/32	1/16	1/32	1/8	5/16	1/4	3/4	4
3/8	29/32	11/32	9/16	1/4	1/8	3/32	3/64	11/64	23/64	3/8	1	5
1/2	1 7/32	15/32	3/4	3/8	3/16	3/32	3/64	15/64	39/64	3/8	1	6
5/8	1 7/16	9/16	7/8	7/16	7/32	1/8	1/16	9/32	23/32	1/2	1 1/4	7
3/4	1 5/8	5/8	1	1/2	1/4	1/8	1/16	5/16	13/16	1/2	1 1/2	8
7/8	1 7/8	3/4	1 1/8	9/16	9/32	3/16	3/32	3/8	15/16	3/4	1 3/4	10
1	2 3/16	13/16	1 3/8	5/8	5/16	3/16	3/32	13/32	1 3/32	3/4	2	12
1 1/8	2 13/32	29/32	1 1/2	11/16	11/32	7/32	7/64	23/64	1 13/64	7/8	2 1/8	16
1 1/4	2 19/32	31/32	1 5/8	3/4	3/8	7/32	7/64	31/64	1 19/64	7/8	2 1/4	20
1 3/8	2 7/8	1 1/8	1 3/4	7/8	7/16	1/4	1/8	9/16	1 7/16	1	2 3/8	25
1 1/2	3 1/4	1 1/4	2	1	1/2	1/4	1/8	5/8	1 5/8	1	2 1/2	30
2	3 3/4	1 1/2	2 1/4	1 1/8	9/16	3/8	3/16	3/4	1 7/8	1 1/4	2 3/4	35
2 1/2	4 1/4	1 3/4	2 1/2	1 3/8	11/16	3/8	3/16	7/8	2 1/8	1 1/2	3	40
3	4 3/4	2	2 3/4	1 1/2	3/4	1/2	1/4	1	2 3/8	2	3 1/2	45
3 1/2	5 1/4	2 1/4	3	1 3/4	7/8	1/2	1/4	1 1/8	2 5/8	2	4	50
4	6	2 1/2	3 1/2	1 7/8	15/16	5/8	5/16	1 1/4	3	3	5	60

TABLE IV

Material Allowances for Flash-Butt Welding Low Carbon and Low Alloy Steel Solid Rounds, Squares, Hex Bars and Rectangular Sections Where the Ratio of the Maximum to Minimum Cross-Sectional Dimension Does not Exceed 1.5:1.0

sharply because of the fluorescence. By this method defects can be seen much more readily than by the regular magnetic method. To date fluorescent inspection is confined to the wet method as the dry method is still in the developmental stage. Magnetic testing is, of course, applicable only to magnetic materials.

Fluorescent penetrant testing: A well-known test for defects in materials is the "Kerosene-whiting" test, where the part in question is soaked in kerosene and then covered with whiting. The kerosene seeps from defects extending to the surface and stains the whiting. This test, at least for magnetic materials, has been supplanted more or less by the magnetic test outlined above. For non-magnetic materials a fluorescent penetrant method has been recently devised. The part to be tested is submerged in or flushed with a light oil containing an oil soluble fluorescent agent. Then the excess penetrant is removed by rinsing with water and the part dried. A finely divided powder is applied to the surface of the part which draws the penetrant from any crack or defect which comes to the surface. The part is then inspected under near ultra-violet illumination. Since the penetrant fluoresces, defects are readily seen. This method picks out only flaws which come to the surface. Subsurface defects and non-metallic inclusions on the surface are not shown up. Hence this method is not as selective as the magnetic method in testing of steels. When the magnetic and fluorescent tests described above are applied to flash welds, the upset is usually removed first. The defects which may be found in poor flash welds are:

1—Lack of fusion where the weld line meets the weld surface, i. e., the parting line between the two upset portions penetrates below the original surface of the piece

2—Presence of oxide or slag in the weld

3—Transverse cracking in the heat affected zone, occasioned by the drastic hardening of steels of high hardenability (such as high carbon or high speed tool steels) due to fast cooling after welding. If cracks such as these are apparent, it is necessary to slow down the cooling of the weld. Means of doing this will be taken up under "Metallurgical Characteristics," which will be presented in Part III.

Radiographic testing: X-raying of arc welds is done very extensively today and reveals such defects as porosity, cracking and slag inclusions. Not much work has been done in the radiographic testing of flash welds. The reason for this is that none but the grossest defects can be seen by routine radiographic methods, and the lack of defects, as shown by radiograph, is no guarantee that the weld is sound.

For instance, a flash weld which was cut transversely on either side of the weld, providing a slice 3/16 in. thick, was radiographed. Nothing showed on the film, in spite of the fact that metallographic inspection revealed small voids and inclusions in the weld. Another test weld made in a 5 in. diameter cold rolled steel bar was cut transversely either side of the weld, so that a ½ in. thick slice was obtained. The slice was radiographed. This weld contained three large non-fused areas, since the machine on which the weld was made was too small to produce the best weld possible in such a work size. Fig. 11 shows a print of this radiograph, taken of one-half of the weld in the 5 in. diameter round section. Radiographic technique for flash welds may be developed in such a way as to bring out the small defects which are known to be detrimental.

(To be Concluded)

Contour Control Device Uses Air Gage Principle

A NEW contour control which employs the principle of the precision air measuring gage to obtain high accuracy in the automatic operation of machine tools has been developed by Bailey Meter Co., Cleveland. It employs a pneumatic system which scans a thin metal template and controls hydraulic cylinders which accurately position the cutting tool or the work with relation to the tool. On turning, boring and facing from templates accuracy of repetition is within 0.0002 in. and surface smoothness is limited only by factors other than the control. When both the tool and the template have been properly ground and honed, the control has operated an engine lathe to produce a surface smoothness of 60 micro-in.

Contours may include slow and fast tapers, round corners and square shoulders. Difficult contours which formerly required the use of special forming tools may be turned with one setting of a simple tool.

Bailey contour control was originally developed for use in the company's own shop to make flow meter parts which exactly match the contour of specially calibrated master parts. Several of the original models have been in operation for over three years.

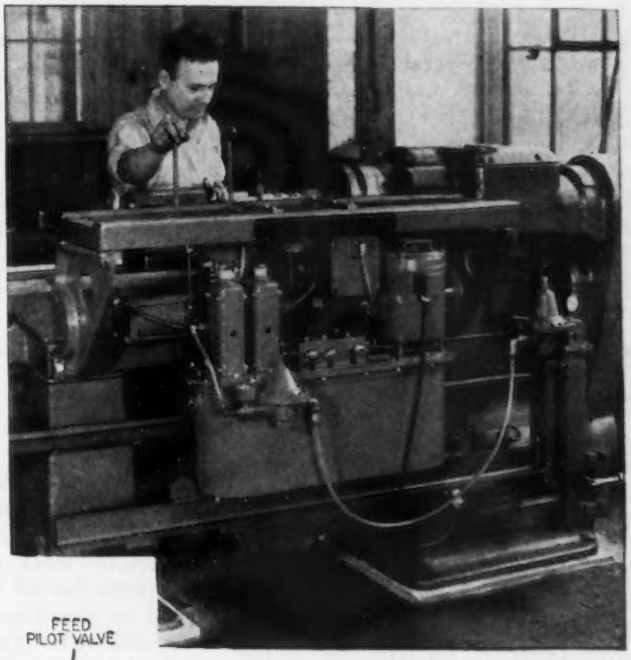
The accuracy of the control is secured by using the air control system as an amplifier of motion and a source of power in transmitting the movement of the tracer stylus to the hydraulic control system. The tracer design, which is based on the "bleeding" of an air flow to regulate a back pressure, employs the same principle used in precision air measuring gages, except that the air flow is governed by the stylus position instead of by the size of the piece being measured.

In Fig. 1 the contour control is shown applied to the cross slide and carriage feed of an engine lathe. Both feed motions are obtained through hydraulic cylinders governed by the two pilot valves shown at the upper right. The air loading pressure is applied to flexible metal bellows which are connected to the stems of the pilot valves. The spring backed bellows breathe during changes in air pressure but are always in a position corresponding to the air loading pressure.

Air is supplied to the system from a constant pressure source through an orifice of the proper size to maintain a loading pressure of 35 lb. per sq. in. when the tracer is in its neutral position. As the spring loaded tracer follows the template, changes in contour tend to increase or decrease the air loading pressure by changing the rate of flow from the air pilot nozzle.

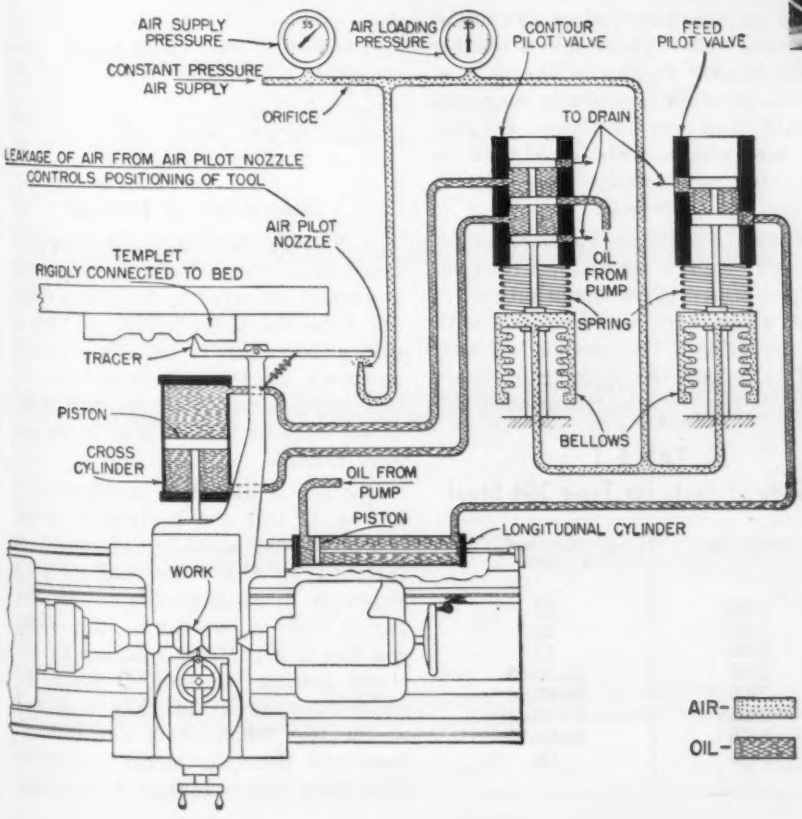
LEFT

FIG. 1 — Application of the Bailey contour control device to an engine lathe, shown in diagrammatic form. Metering of the air flow at the pilot actuates two hydraulic pilot valves which control coordinate feed movements.



BELOW

FIG. 2 — Contour control applied to a Hendey lathe. The hydraulic power unit at the rear slides along rails and follows the longitudinal feed of the carriage. Hand controls may be used to speed up production at some sacrifice in accuracy.



How System Works

If at the time the control is placed in operation, the cutting tool is not in contact with the work, the air flow from the pilot nozzle is restricted and the air loading pressure increases above its neutral value of 35 lb. The contour pilot valve of the hydraulic system moves upward, draining the

(*Continued on Page* 174)

A Quantitative

Hot Workability Test for Metals

An elevated temperature, high-speed torsion test is herein described for testing the hot workability of steels. Small bars are twisted to failure at various temperatures. The number of revolutions made before failure is a measure of the ductility of the metal at that temperature. These test data correlate very well with mill results in hot piercing operations, and likely will show excellent correlation with forging and other hot working operations.

By HARRY K. IHRIG

Director of Laboratories, Globe Steel Tubes Co., Milwaukee

IRON and steel have been hot worked for several thousand years, but difficulty often has been encountered in the cracking of the metal under hammer blows. With the introduction of various alloying elements this red shortness of steels has increased. The stainless steels are particularly susceptible to rupture when worked at high temperatures.

For another article on this noteworthy testing technique, see "Evaluating Steel Forgeability," THE IRON AGE, issue of March 16, 1944.

There has been no satisfactory method of testing a steel to determine whether it could be hot worked and at what temperature it had maximum hot workability. The usual method was to heat samples at different temperatures, remove them from the furnace and hit them on a cold anvil with a cold hammer. Examination of the flattened samples for cracks gave a qualitative measure of their hot workability. There are many uncontrolled variables in this procedure and the results cannot be quantitatively expressed. It was impossible to compare numerous heats and to set up test standards for correlation with large scale operations.

Ellis[1] has measured the reduction in height of steel samples after hitting them with a single blow of a hammer to determine their malleability.

[1] *Ellis, "An Investigation Into the Effect of Constitution on the Malleability of Steel at High Temperatures." (Carnegie Scholarship Memoirs, Vol. XV, 195 (1926).)*

Sauveur[2] has shown that steels in torsion show changes of torsional strengths while in the blue brittle range and when passing through their critical points. His experiments were all done at temperatures below 2000 deg. F. and at very slow and variable speeds.

In the manufacture of seamless tubing by roll piercing solid rounds, the metal is very vigorously hot worked. In fact, the whole process depends on the rupturing of the center of the round by the deformation caused by the cross rolls. There are a number of mechanical factors in the process, but temperature is probably more important than any of these. Forging and hot tensile tests could not be correlated successfully with mill results on the same heat.

To obtain accurate information for piercing steels, a method has been developed which gives quantitative results which can be correlated with mill operations. This method has been used to control the piercing of steels since 1938. It was mentioned by Thum[3] in 1940. Over 7000 tests have been made and used to determine the best conditions for the piercing of a wide variety of carbon, alloy and stainless steels.

TABLE I
Results of Tests for Type 304 Steel

Temperature, Deg. F.	Number of Turns
2100	27
2150	33
2200	43
2250	52-50-52
2300	58-60-55
2350	65-46-65
2400	66-66-72
2450	69

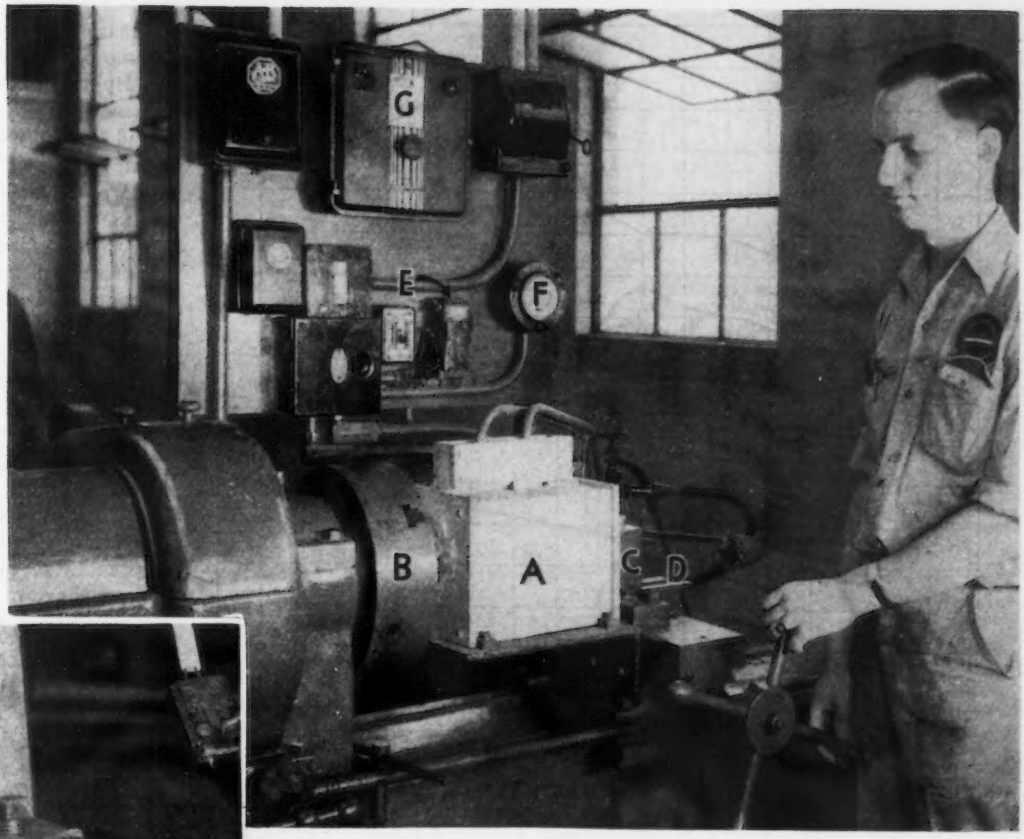
[2] *Sauveur, "Steel at Elevated Temperatures," Trans. A.S.S.T. 17,910 (1930).*

[3] *Thum, "Critical Points," Metal Progress 37,535 (1940).*

Description of Method

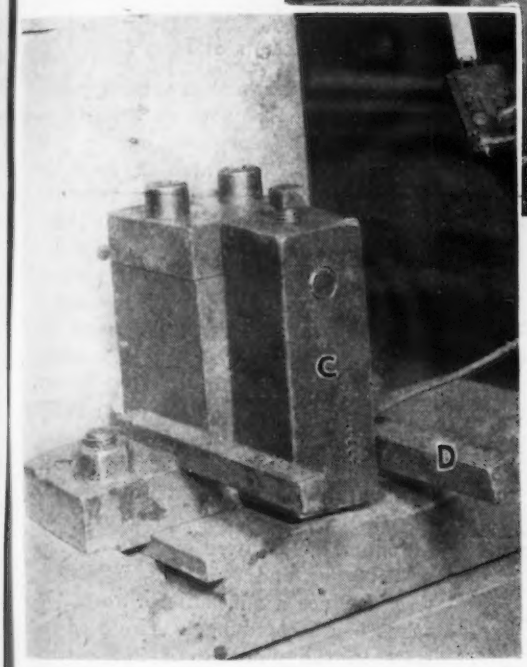
A 9/16-in. bar 22 in. in length is made from the steel to be tested. It is usually prepared by forging a ⅝-in. bar from the large billet and this is cold drawn to 9/16 in. This method assures a cross-section proportional to the original one, with no layers removed such as would occur if the bar were turned.

The bar is placed in the furnace *A* in Fig. 1. One end is clamped in the chuck *B* and a heavy clamp *C* is fastened on the other end. Fig. 2 shows the detail of the clamp end. The bar is free to expand on the clamp end but is kept from rotating by the clamp hitting the stop *D* when the torque is applied. The bar is soaked at the test temperature for half an hour and then the motor is started. The clamp makes contact with a stop



RIGHT

FIG. 1—Equipment used for high speed torsion testing of bars at high temperature.



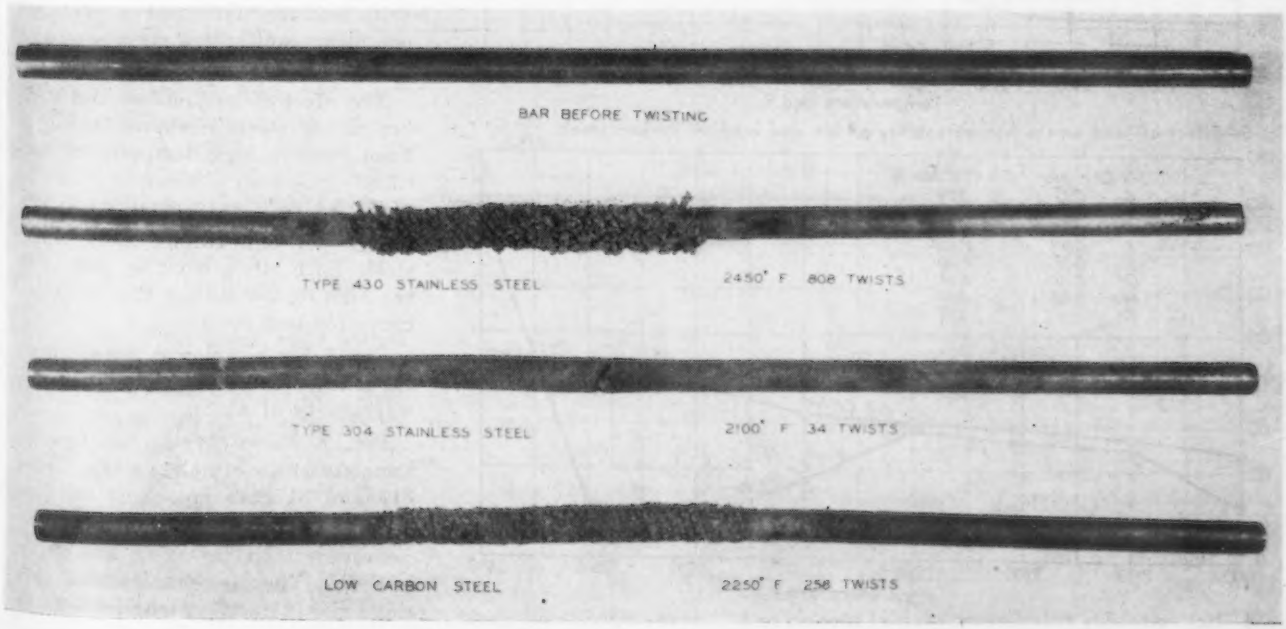
LEFT

FIG. 2 — Details of the clamp end of the testing equipment.

BELOW

FIG. 3—Tested bars of several steels. Some steels will withstand 1100 twists.

D and energizes the electric circuit of a mechanical counter which records the number of revolutions on the counter *E*. When the bar breaks, the clamp falls away from the stop and opens the circuit which stops the counter. Thus an accurate record of the number of revolutions made until the bar inside the furnace breaks is recorded. The bar is twisted at a rate of 128 r.p.m. The temperature of the furnace is controlled by the regulator *F* and measured by the pyrometer *G*. The furnace is mounted on a carriage



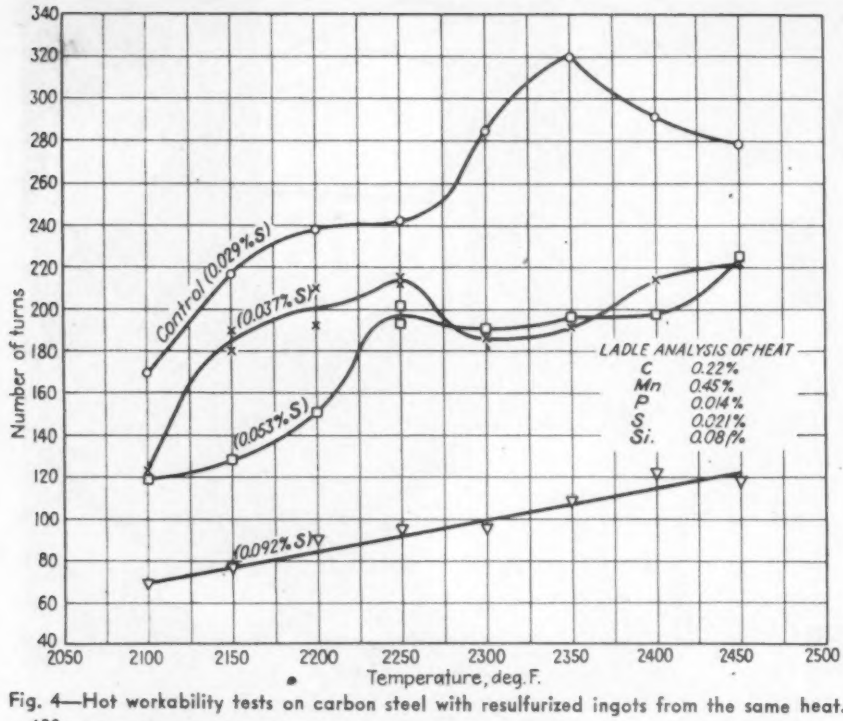


Fig. 4—Hot workability tests on carbon steel with resulfurized ingots from the same heat.

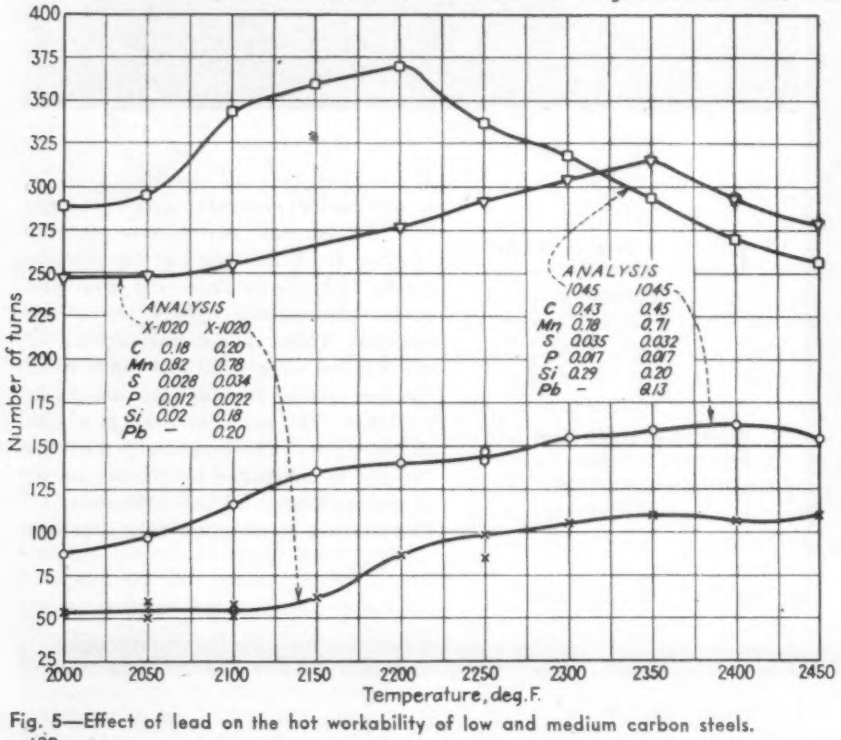


Fig. 5—Effect of lead on the hot workability of low and medium carbon steels.

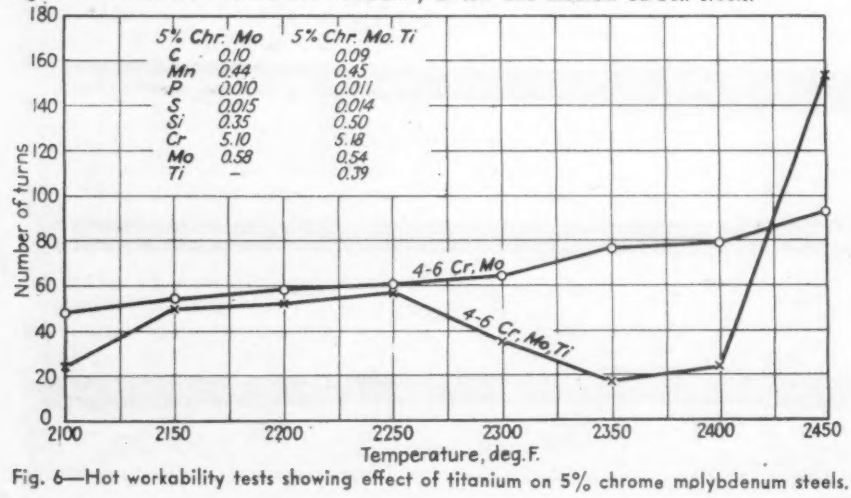


Fig. 6—Hot workability tests showing effect of titanium on 5% chrome molybdenum steels.

and may be moved back to facilitate removal of the broken specimens.

By this method, the bar is heated to accurately controlled temperatures and is subjected to rapid, uniform twisting until failure occurs. The bar is worked at the testing temperature while still in the furnace. The number of twists made before failure is a measure of its hot workability. The action is fast and hence more comparable to commercial hot working than tensile or other slow deformations. Bars are tested at a series of temperatures and the temperature that allows the maximum number of turns before failure is the best one for piercing. Some steels have been tested which withstood less than one revolution and others have not failed up to more than 1100. Fig. 3 shows tested bars of several steels.

Results of Tests

It is well known that sulphur markedly affects the hot workability of carbon steels. An open hearth heat of low sulphur content is shown at the top curve in Fig. 4. Ingots from the same heat were resulphurized and tests made on bars from these ingots are shown in the other curves. The actual sulphur content of the bars used is shown on the curves. Even small additions of sulphur decrease the number of twists before failure. A higher sulphur content reduces the number markedly. The 0.029 per cent sulphur steel shows an increase in the number of turns from 170 at 2100 deg. to 320 at 2350 deg. F. The 0.092 per cent sulphur steel showed only 70 and 100 at 2100 deg and 2450 deg. F. respectively. Since a minimum of about 150 turns has been found to give good results in the piercing of low carbon steels, it is obvious from the test results that the high sulphur steels will not pierce well. This correlates with mill experience.

The effect of lead on low and medium carbon steels is shown in Fig. 5. Lead reduces high temperature ductility.

Fig. 6 shows the effect of titanium in a 5 per cent chrome molybdenum steel. Such steels must be pierced on the high or low side of the dip in the curve for best results.

Fig. 7 for nickel and monel shows the marked effect of copper on the hot workability of nickel.

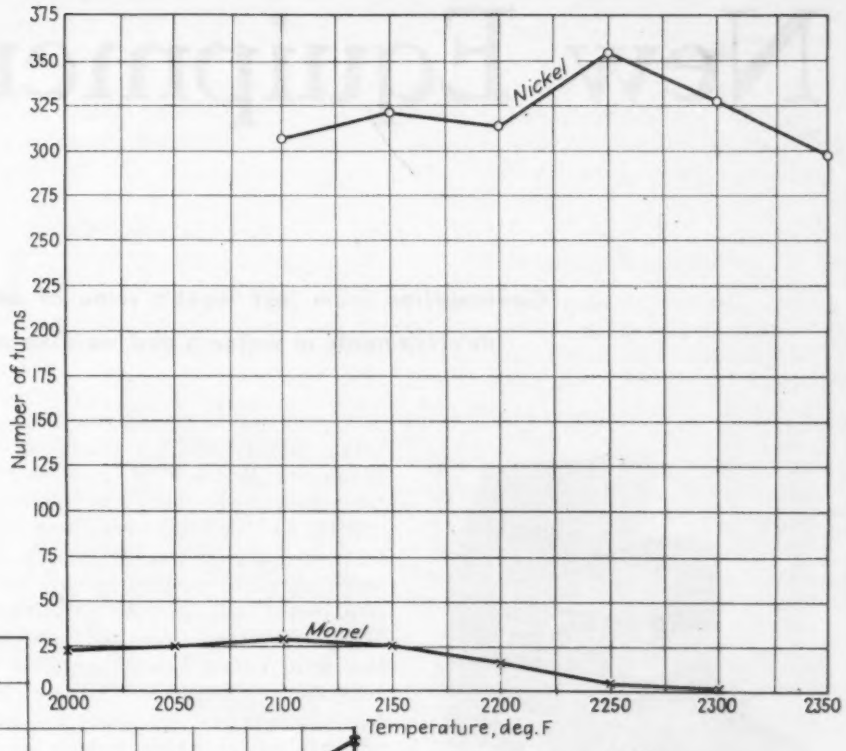
Fig. 8 shows typical curves for some austenitic stainless steels. Types 347 and 317 are hot short and are difficult to pierce and roll.

Ferritic stainless steels are shown in Fig. 9. They are characterized by a rapid rise in ductility with increase in

temperature. The maximum number of twists of ferritic steels is greater than the maximum of the austenitic steels. These maximums correlate with their relative pierceabilities on the mill.

Table I shows the results of tests of several bars at the same temperatures, from a single heat of Type 304 steel. The reproducibility of the results is very good except for one test at 2350 deg. F. This lower number of turns may have been caused by a small seam or crack in the bar which was not noticed before the test.

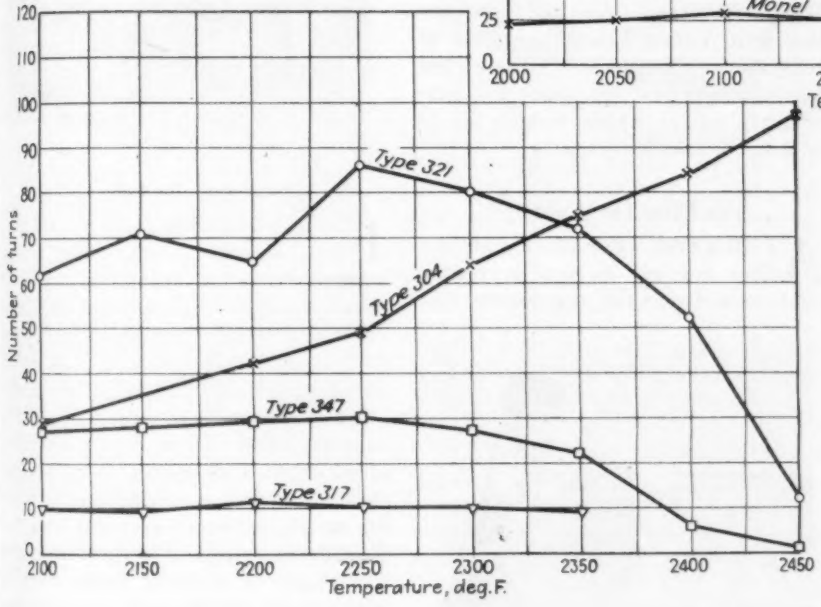
There is a marked variation in the hot workability of different stainless steel heats of the same type. Table II gives the analyses and hot workability tests on several Type 304 and Type 321 heats.



ABOVE

FIG. 7—Hot workability tests on nickel and monel.

o o o



Correlation with Mill Operations

Type 304, heat "A," which showed a maximum number of twists of 95, pierced very well on the mill. No inside laps were found. Heat "B," with 51 twists, gave intermediate results on the mill. Inspection showed that 14.1 per cent of the total length rolled had inside laps. Heat "C," with a maximum of 44 twists, showed very poor results on the mill. About half of the length of the tubes rolled was scrapped.

In the Type 321 heats, "D," with a maximum of 86 turns, showed 4.9 per cent of the tubes to be lapped. Heat "E" had small inside laps in almost all of the tubes. Heat "F" lapped and tore in the piercer so that it was almost entirely scrap.

In one instance, a certain stainless steel had been pierced 150 deg. too low for a number of years with mediocre results on the mill. Since raising the temperature as indicated by the test much better yields have been obtained. Several times heats that were rolled before the hot workability tests had been made on them were removed from the furnace after a number of billets were tried. These heats were designated as not pierceable by the mill. After determining the proper piercing temperatures, the heats

(CONTINUED ON PAGE 170)

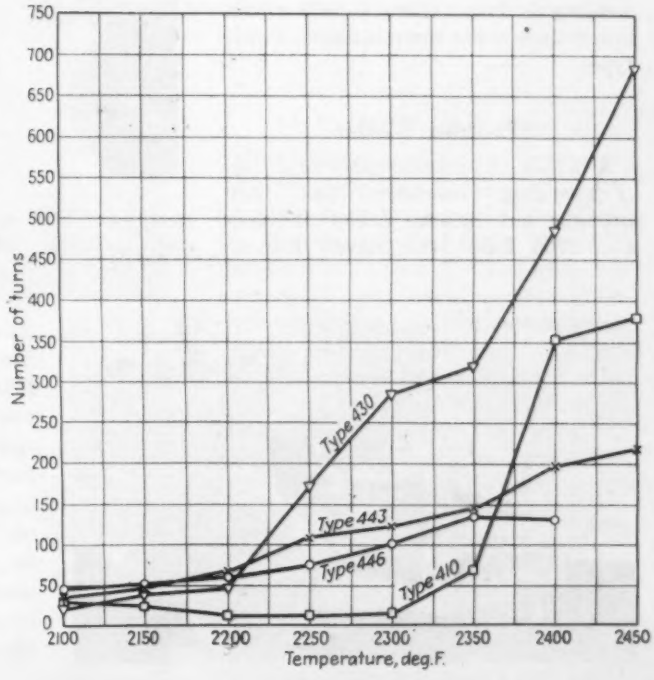
ABOVE

FIG. 8—Typical curves of heats of austenitic stainless steels.

o o o

RIGHT

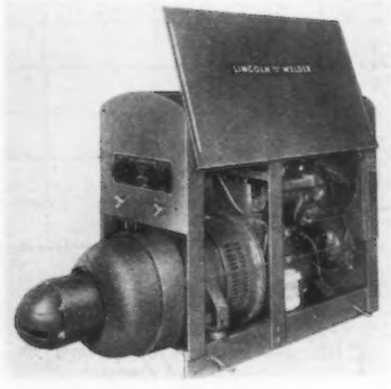
FIG. 9—Typical curves of ferritic stainless steels.



New Equipment . . .

Welding

. . . Continuation from last week's issue of description of recent developments in welders and welding accessories.

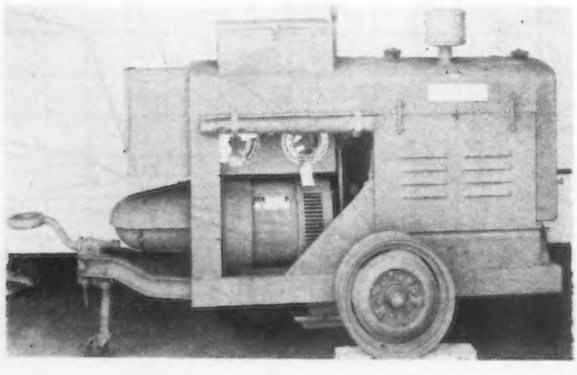


Engine Driven Arc Welder

A "SHIELD-ARC" engine-driven welder rated at 200 amp. with 29 hp. gasoline motor is announced by the *Lincoln Electric Co.*, Cleveland. Current range is 40 to 250 amp. Dual control of welding current is accomplished by adjustment of series fields and generator speed. For metallic arc welding, with bare or coated electrodes, the new model also supplies uniform welding current for carbon arc welding. Engine speed for most welding is from 1150 to 1400 r.p.m. lower than usual for machines of this type.

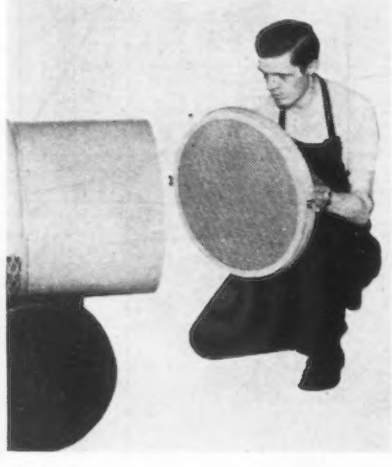
Portable Welder

A LINE of portable gasoline driven welding machines has been brought out by the *Libby Welding Co.*, 2700 East 14th Street, Kansas City. Model LWL is made up of Waukesha Model FCU gasoline motor driving a 200 amp. Lincoln "Shield Arc" welding generator. The machine may be easily moved by hand. Similar assemblies have been constructed using Allis-Chalmers, Willys Overland Jeep or Ford motors with either Lincoln or P & H generators. Because of their low center of gravity, the units are particularly useful where welding is to be done in rough terrain.

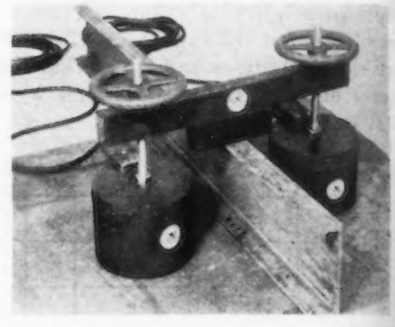


Air Filter for Welders

A PERMANENT, all metal air filter for use on d.c. generator welders and similar machinery and



equipment that is exposed to process and air-borne dust has been announced by *Air Devices, Inc.*, 17 East 42nd Street, New York 17. The impingement type filter unit traps all dust particles before they can reach rotating parts of the equipment. Encased in an arc-welded steel frame, it can be removed easily for quick cleaning. It is available in sizes to fit all standard welders.

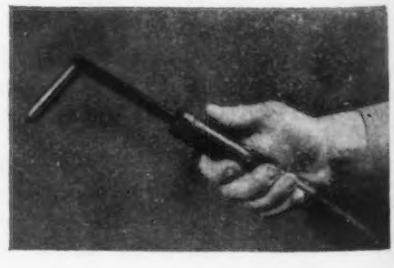


Magnetic Plate Aliners

FOR alining butt end plates for tack welding or for positioning warped plates for welding to stiffener beams, magnetic aliners have been developed by *Hercules Electric & Mfg. Co., Inc.*, 2416 Atlantic Avenue, Brooklyn 33, N. Y. When used for alining butt ends, the aliner is placed squarely on the seam and when energized draws both plates flush against the base of the magnet, thereby trueing up the adjacent area for tacking. A stiffener bar may be held in place by means of a cross beam with a hole at each end through which passes the threaded shaft of an aliner. By turning the handwheels shown, pressure can be applied through the cross beam directly to the stiffener bar, causing it to be pressed firmly against the plate to which it is to be welded.

Helium-Shielded Electrode Holder

A HELIUM-SHIELDED arc welding electrode holder for manual operation has been announced by the electric welding division of *General Electric Co.*, Schenectady. It may be used with either helium or argon gas



and is especially designed for use in the welding of light metals. The holder consists of a Textolite handle, a steel gas nozzle and a copper electrode clamp fitted with a tool steel spring-collet. The clamp will hold a tungsten or carbon electrode until all but a ¾ in. stub is consumed.

Welding Spotlight

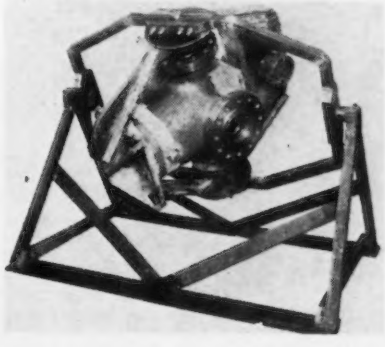
A SPOTLIGHT designed to provide glareless illumination of sufficient intensity for an arc welding operator to see his work distinctly through the dark lens of a welding helmet prior to striking the arc has been announced by the *General Electric Co.*, Schenectady. It is especially desirable for production line welding in which the establishment of the arc must be made quickly and accurately, such as in the welding of thin materials, light alloy castings and aircraft parts. Mounted on an upright, telescoping metal standard with a 30-lb. cast iron base, the spotlight consists of three 300-watt reflector spot lamps surrounded by a circular shade. The light beam can be increased from a single, sharp spot 7 in. in diameter to a clover leaf shaped pattern approximately 17 in. across at its widest point.

Wire Solder

A FLUXED wire solder, Fluxrite, which contains flux in longitudinal grooves on the surface rather than in the conventional core, has been placed on the market by the *National Lead Co.*, 111 Broadway, New York 6. The flux, being on the outside, liquefies and flows onto the work before the solder melts. A continuous flow of flux is obtained. The flux supply, being outside the wire, can be checked quickly and readily. It comes in the same diameters as regular cored solder.

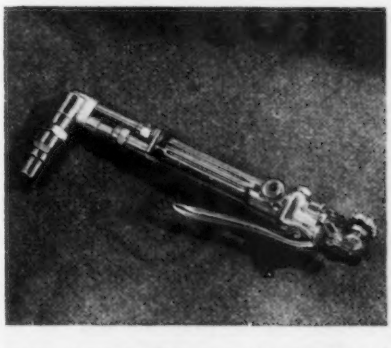
Welding Gimbal

MADE from salvaged bar stock at *General Electric's* Erie Works, the gimbal illustrated halves the time previously required for welding certain miscellaneous parts. Setting the work in the best welding position is easy and the liberal distances between frames assures plenty of hand clearance for safety.



Underwater Torch

AN improved underwater cutting torch, Model 3900, has been introduced by *Victor Equipment Co.*, 844 Folsom Street, San Francisco. The air mantle is so designed that it limits slagging of the tip and adjustments can readily be made under water. The gas control valves can be easily manipulated when the diver wears heavy gloves and operates in murky water. The torch is easily maintained in service.



Flame-Welding Lenses

NOVIWELD-DIDYMIUM lenses for flame welders are available in a No. 3 shade, *American Optical Co.*, Southbridge, Mass., announces. Lenses made from this glass are said to absorb sodium flare and to protect eyes against both ultra-violet and infra-red radiation. Ground and polished to ophthalmic standards, the lenses preserve orange and red color values so that welders can see the red hot bead and the molten metal in brilliant colors.

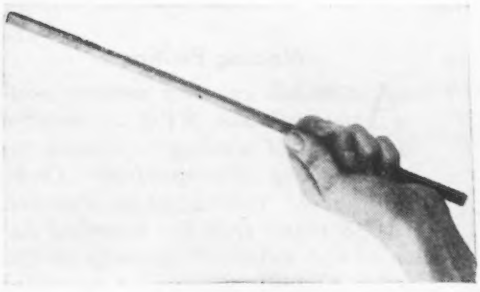
Welding Positioner

A 2500-LB. capacity welding positioner, Model WP-2, is included in the line of positioners recently introduced by *Harnischfeger Corp.*, Milwaukee. Table is 42 in. diameter, has 18 radial slots for mounting fixtures and is turned manually to suit welding speed. Tilting is controlled by hydraulic power with 135 deg. beyond horizontal position obtainable. Both table movements have positive locking devices. Telescopic column with self-locating stops provides for table elevation from 28 in. minimum to 60 in. maximum from floor, depending on type of mounting. Portable or column-in-floor mountings are available.

H. S. S. Welding Rods

TO effect repair of high speed cutting tools, the process of Suttonizing has been developed by the *Welding Equipment & Supply Co.*, 223 Leib Street, Detroit 7. Suttonite No. 1 or No. 2 high speed steel welding rods are applied by the oxyacetylene method, using a carburizing or an excess of acetylene flame. Suttonite No. 1 is a cast rod and is for applications requiring maximum resistance to abrasion, such as lathe centers. Suttonite No. 2 can be applied, with or without subsequent heat treatment, by the atomic-hydrogen welding method. The No. 2 rod is made from drawn alloy welding wire, giving a denser structure and freedom from porosity. Deposits are said to have the cutting qualities of cobalt-tungsten high speed

steel, are hard as welded and drawn and usually no subsequent heat treatment is necessary.



Galvanizing Bar

TO facilitate repair of damaged galvanized surfaces, the *American Solder & Flux Co.*, 2152 East Norris Street, Philadelphia 25, has brought out a galvanizing bar which is rubbed on the damaged surface, heated and brushed until the coating sets.

Aluminum-Bronze Electrode

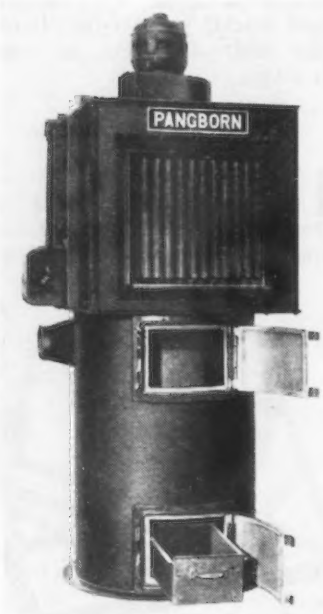
THE *Air Reduction Sales Co.*, 60 East 42nd Street, New York 17, announces the Airco No. 100, a coated aluminum-bronze shielded arc electrode. Universal in application, it can be used for welding of most bronzes, malleable and cast iron or steel. It can also be used for welding dissimilar metals, such as cast iron to brass, steel to malleable iron, or the joining of any two metals which are weldable with aluminum-bronze. Sizes range from ⅛ to 3/16 in. in 14 in. lengths and ¼ to ½ in. in 18 in. lengths.

Arc Time Recorder

A SYSTEM of production welding control built around an arc timer is being introduced by *Harnischfeger Corp.*, 4460 West National Avenue, Milwaukee 14. The arc timer shows the exact time spent in actual deposit of weld material as well as total idle or non-productive time. Visual records provide basic information necessary for complete and accurate control over costs, procedures, production and quality. The system has particular application in conjunction with base-rate-plus-premium compensation.

Dust Collector

THE type CK unit dust collector of rugged construction for industrial applications has been put on the market by *Pangborn Corp.*, Hagerstown, Md. Suitable for all dry dust



control applications, it is flexible in arrangement to permit adaptation to a variety of field conditions. It is available in three sizes with capacities to 1000, 2000 and 3000 cu. ft. of air per min. The unit consists of two major sections—a preliminary centrifugal section in which the bulk of the entrained material is separated and a secondary cloth screen section where the fine dust is effectively filtered from the air.

Refrigeration Unit

AN air-cooled "packaged" 1½ hp. refrigeration unit, designed for cooling resistance spot welders and for other specialized industrial liquid cooling service has been announced by *Airtemp Division, Chrysler Corp.*, Dayton, Ohio. The packaged resistance welder cooling unit is completely self-contained and is equipped with the Airtemp hermetically sealed radial compressor. The new unit has ample capacity to cool all types of resistance spot welders when handling aluminum or ferrous metals. A remote bulb thermostat having a range from minus 20 deg. to plus 20 deg. F. controls the temperature of the coolant.

Welding Torches

DESIGNED for fast, light welding, Models 40NL and 41NL Torchweld airplane welding torches have been developed by *National Cylinder Gas Co.*, 205 West Wacker Drive, Chicago 6. They may be used for welding on aircraft tubing, light sheet metal, aluminum and various alloys. Interchangeable mixers permit the use of either style tip for welding up to ¼ in. thickness.

Pressure Vessels

WELDED pressure vessels are being offered by the *American Instrument Co.*, Silver Springs, Md., which were designed especially for the storage of compressed gasses at pressures up to 6000 lb. per sq. in. Used in the inverted position, standard vessels are equally well suited for small liquid-pressure accumulator service. They are fabricated from the desired lengths of seamless tubing, to which is welded at each end a cap machined from solid bar steel. The contents of the vessel are drained through a ¼ in. union drain plug of special design.

General Purpose Electrode

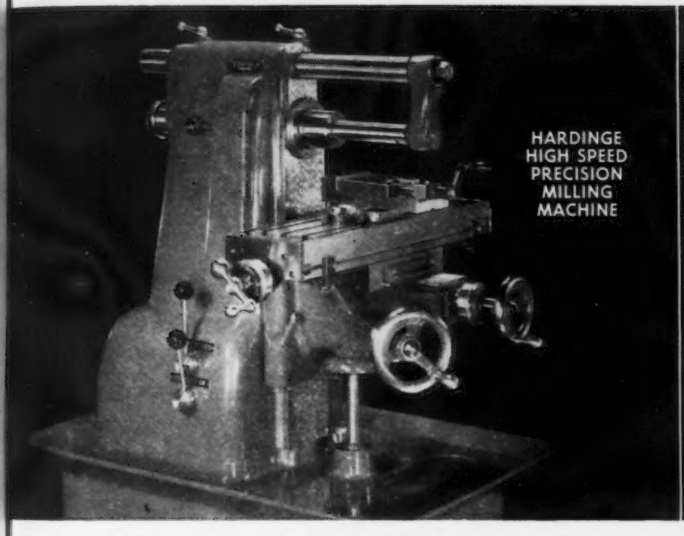
FOUR additions to its line of Perfection welding electrodes have been announced by the *Anthony Carlin Co.*, 2717 East 75th Street, Cleveland. Grade P-61 is a shielded arc, general purpose, straight polarity d.c. electrode for welding mild steel in all positions. P-103 is a shielded arc a.c. electrode suitable for all position welding. P-170 and P-180 are bare and wash coated electrodes. These are straight polarity d.c. electrodes which have a broad field of application.

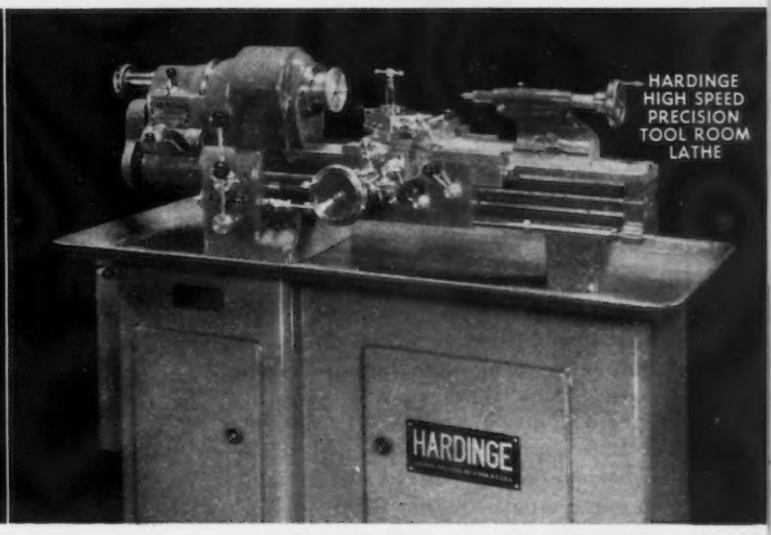
Electrode Holder

AN electrode holder designed to allow complete insulated use of welding electrodes to the butt has been announced by *Chicago Tool & Engineering Co.*, 8383 South Chicago Avenue, Chicago. The holder has an automatic locking barrel to facilitate easy removal and replacement of electrodes and a solderless connector permits quick detachment of the holder from the cable. The holder is made only in a 300 amp. model and will take electrodes up to 5/16 in. It is designated the Palmgren 300.

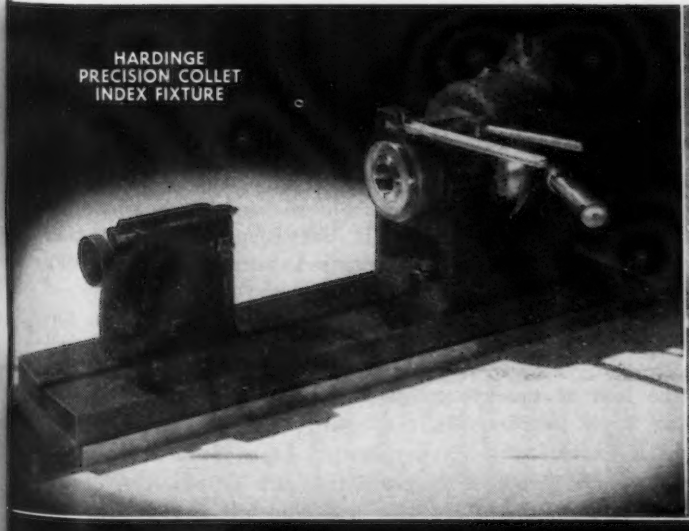
HARDINGE

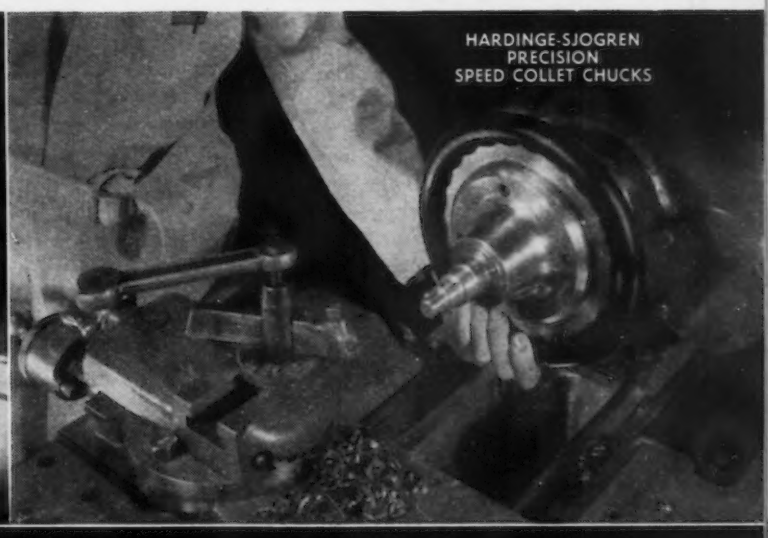
Performance has established leadership





for HARDINGE Precision Equipment





HARDINGE BROTHERS, Inc., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

Assembly Line . . . STANLEY H. BRAMS

• Diesel engine makers expect to retain broader markets after war ends using "packaged power", higher speeds, and more flexibility as sales points . . . Trucks probably are largest field.

DETROIT—Only lightly touched in the industrial surveys of the effect of the war has been the most remarkable growth of the diesel industry.

No exact figures are being released these days, but it seems fair on the basis of the evidence known to figure that about as much power in diesel output is being manufactured each month these times as was recorded in entire pre-war years. Of course a 12-fold growth of this sort, which probably would place diesel horsepower output at somewhere above 20,000,000 hp. per year, still leaves the industry a pigmy alongside the Otto cycle engine business. But this war has seen the diesel definitely stake claims in a variety of fields with enough depth so that the postwar winds are not likely to blow them away.

Probably the most notable development of the war insofar as diesels are concerned has been the very positive growth of "packaged power." Some light was shed on this before the Society of Automotive Engineers this year by Edward C. Madgeburger, engineer of the Navy Bureau of Ships, who described no less than 12 arrangements of diesel cylinder arrangements—which in a broad sense means power plants—making possible the tailoring of diesel engines to a specific job.

The most publicized among these has been the General Motors "quad," a four-engine unit of 24 cylinders with a pinion between each pair of crankshafts in tandem, engaging a bullgear on the driving shaft. The obvious advantage of this arrangement is that it permits use of any or all of the four engines in the set, thereby developing advantages of flexibility heretofore unachieved in a diesel engine.

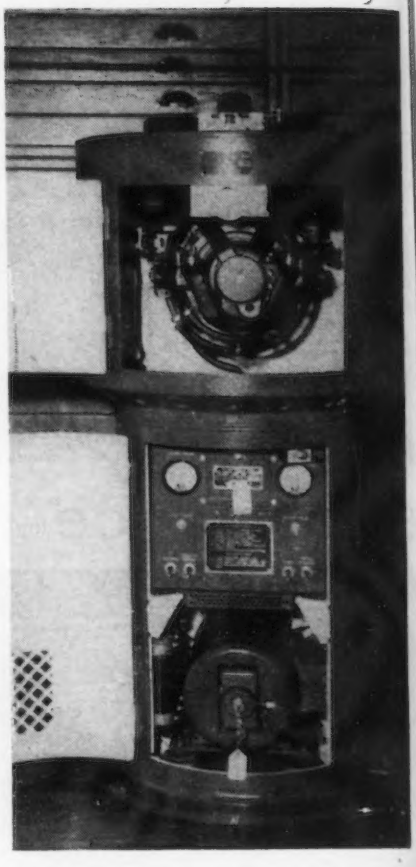
The use of a number of engines each contributing power to one outfit is, of course, not entirely new. It is said to be one of the secrets of construction of the German pocket battleships—reports are that engines were put down in a great variety of locations, rather than assembled in one central engine room, thereby making most efficient use of space.

Postwar advantages of diesel clusters are readily apparent. Industry proponents expect that one big field will be in fishing boats, which can use full load in getting quickly from one fishing bank to another, partial load on the scene, and partial load on the home trip, with the balance of the power potential utilized to refrigerate the catch. Marine installations will likely become an increasingly important factor in the diesel business. The statistics show that there are some 85,000 boats in our fishing fleet alone, pointing to a market of tremendous size.

Somewhat similarly grouped arrangements are in use in diesel locomotives, where maintenance work on one bank of cylinders is apt to be in process while the other banks are moving the train.

Another war-developed milestone for diesel power plants has been marked increase in speed. Bearing difficulties were a primary block on this road—in recent years, engineers figured that bearings operating at 30 ft. per sec. were about at their upper limits. Now they are operating—with engineering approval—at 80 ft. per sec., making notable gains in speed possible.

PRODUCERS of smaller size diesels, like General Motors, Caterpillar Tractor, International Harvester, Hercules, Walker-Shaw, Cummins, and others will probably strike heavily for the long distance rugged duty highway truck market after the war. This is expected by many diesel industrialists to be their most profitable line. Higher initial costs for such power plants are more than balanced by the savings involved.



INVASION GYROCOMPASS: *Because of the small size of this gyrocompass, it has been earmarked for use on small naval craft, especially landing craft that is too small for the standard gyrocompass. It can be dissembled into two parts.*

Diesel bus installations are expected to proceed to complete saturation point, inasmuch as such power plants weigh no more than typical gasoline installations (a very important factor in bus engineering) and, of course, boast enviable operations savings.

Of interest in these highway applications has been the outcome of recent experiments on the quality of fuel which could be used on diesel operations. It has been a by-word that diesel engines would burn anything which could be volatilized. Use of kerosene in diesels has not been uncommon practice in Texas, where fuel oil taxes worked to the disadvantage of disel users. But, moving upward in the quality scale above kerosene, experimenters are establishing that diesel engines can satisfactorily burn regular gasoline up around the 80 octane level. This, of course, is equivalent to a low octane rating, and consequently comes a reversal of gen-

THESE MEN "TAILOR" TAPS

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They are "tap tailors" extraordinary!

If you merely want a "ready-made" tap of a certain size — you will automatically get the benefit of refinements in design worked out by these "Greenfield" engineers.

But if you give them more information — as to the "fit" desired, as to the material to be tapped, as to operating speeds, etc., then these men can be of extra service in tailoring a tap to fit your needs.

"Greenfield's" engineering staff is large and highly trained. They are continually enlarging the frontiers of screw thread knowledge as a result of more than 70 years of research in Greenfield.

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eral theory—and also as proof of rather surprising flexibility in a diesel. Beyond an 80 octane level, gasoline is so slow in combustion that its use in the compression chamber is unsatisfactory. This finding is probably a freak and does not contribute to the immediate cost advantages of diesel operations, but there may develop corollary findings out of this in the future which will turn into sales points.

Next to trucks and busses, diesel men have their eye on construction and portable machinery field as their number two sphere of operation in the postwar world. Diesels have been somewhat lightened in weight during the war, made somewhat more flexible, and found adaptable for new uses.

One interesting field may be the powering of middle and smaller sized industrial establishments. A diesel power plant for a private home cannot at all be justified economically and the large plant may generally find itself best powered with a steam plant. Small establishments, however, may be able to utilize diesel power quite readily. There is one interesting such application in Chicago, where the diesel plant not only powers the machines of the shop, heats the plant and offices, but also, through the heating air passing in a closed circuit before it is fed into space, serves as a drying medium for one phase of the manufacturing process.

DIESEL people figure that the railroad field is a fait accompli. Diesel locomotive costs for mainline units, freight engines, and switches run around 50 per cent more than steam locomotives, but appear to do from two to three times the work. Electro-Motive is the largest producer in this field, but American Locomotive and Baldwin are moving into it rapidly; and General Electric now has a factory switcher for sale. Perhaps, however, gas turbines will be a postwar challenger for position in this field.

There is quite a substantial postwar market here—of today's 42,000 odd locomotives in this country, only 1500 or so are diesel.

Diesel engines are not considered satisfactory mediums for aircraft use, nor is there expectation that their development will evolve to that point in the next several years. The best diesel aircraft engine produced in the world for aircraft use, so far as is known, was a German development before the war, whose weight was about one kilo (2.2 lb.) per hp. This weight ratio plus its fuel economy made it notable. But at the same time it was far away from the present standard of one hp. per lb. of gasoline-powered engine. Diesel's one chance in the air, some experts believe, may lie in the development of planes of tremendous range and tremendous size, wherein diesel operating economies would bulk large enough to overbalance disadvantages of weight. There are no original cost comparisons necessary here; interestingly enough, standard diesel and gasoline powered aircraft engines cost about the same per horsepower.

Beyond all that is the stationary power field, exemplified in electric lighting in power plants. Such stable names in the diesel field as Fairbanks-Morse, Winton (now a division of GM), Ingersoll-Rand, H-O-R, and others will likely assume their prewar positions in the postwar world.

USES Handles Lake Vessel Manning

Washington

• • • **WMC Chairman** Paul V. McNutt has announced a new plan to assure Great Lakes steamships of adequate crews for the 1944 navigation season. Under this plan, full responsibility of providing crews for lake ships is given to WMC's United States Employment Service.

"We must provide the crews for the 400 or more lake vessels which are to carry more than 90,000,000 tons of iron ore in addition to other vital war materials during the navigation season now getting under way on the Great Lakes," Mr. McNutt said.

Under this plan, the USES offices of the Great Lakes region will receive orders from and refer seamen directly either to the masters of vessels on the shore-side offices or to companies operating lake craft. In the event that unions have collective bargaining agreements, which require the unions to carry the primary responsibility for supplying the crews, orders will be received and workers referred to such unions.

The Recruiting and Manning Organization of the War Shipping Administration, which has offices in Detroit, Chicago, and Cleveland, will cooperate with the USES in its recruiting efforts. The RMO offices in the lake cities were established primarily to recruit seamen for the off-shore fleet. They will be used to supplement and aid USES in supplying the men needed to operate the lake fleet.

The ODT will act as claimant agency for the lake shipping industry in sponsoring requests for area manpower, priority ratings and the establishment of employment ceilings for the industry.

Under the new plan, USES permits Great Lakes seamen to change jobs within the industry without statements of availability. This action was taken because of administrative difficulties in applying the usual employment stabilization plans to the industry. The vessels are in port for a short time and it is frequently impossible to check with former employers in determining the basis upon which the statements of availability should be granted. USES will attempt to persuade seamen to remain in the industry, insofar as to do so would not do violence to the principles and policies of WMC stabilization programs.

Falck Appointed Director of Office of War Utilities

Washington

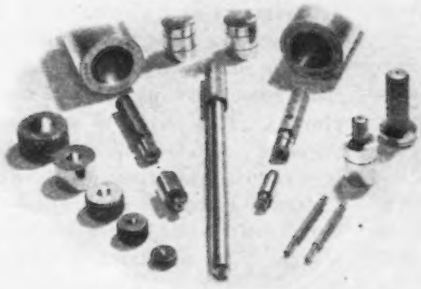
• • • **WPB Chairman** Donald M. Nelson has anounced the appointment of Edward Falck as director of the Office of War Utilities. Mr. Falck succeeds J. A. Krug, who is leaving WPB to accept a commission in the Navy for assignment to active duty. Mr. Falck has been deputy director of the Office of War Utilities since February, 1943, and since March 17 of this year has also served as executive director of the Combined Production and Resources Board. He will continue to fill the latter post while carrying his new assignment.

From 1933 to 1937, Mr. Falck was director of research and rates for the TVA. From 1937 to 1941 he was assistant to the vice-president of the Consolidated Edison Co. of New York; in 1941 he came to OPM, at Mr. Krug's request, to serve as chief of the Power Allocations Section of the Power Division.

Where the "Impossible" In Precision Is Achieved

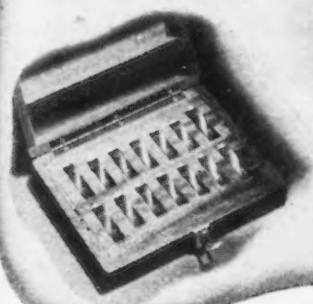
Here Are FOUR of Many LINCOLN PARK "Firsts"

Lincoln Park pioneered the development and is still the largest producer of Carboloy gages.



Lincoln Park was a pioneer in the manufacture and salvaging of gages by chrome plating.

Lincoln Park was the first to produce Carboloy thread gages... to salvage thread gages by chrome plating.



Carblox, recently introduced by Lincoln Park, are the first gage blocks ever produced in cemented-carbide.

WOULD you have believed ten years ago that more than 1,200,000 threaded holes could be gaged with one thread gage? That sort of gage performance is no longer considered unbelievable . . . simply because Lincoln Park tackled the "impossible" job of producing Carboloy thread gages and came up with the right answer . . . and because gages manufactured by Lincoln Park of this wear-resistant material are regularly providing the same long, accurate service life in all types of high production inspection.

The development of Carboloy thread gages is only one of many new ideas in gage-making which originated at Lincoln Park. Each has contributed materially to modern gaging practice. None would have been possible had it not been for the unusual ability of the Lincoln Park organization to solve the toughest problems in extreme precision work.

There are more new developments in progress at Lincoln Park. You can be sure that some of the most important future advancements in the manufacture of gages and precision tools will come from the plant "where the 'impossible' in precision is achieved."

ARMY (E) NAVY

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• Joint Congressional committee seeks to cut down on overstaffed government agencies ... Many activities overlap and are unnecessary . . . Overall manpower slash of 400,000 sought, but little headway is being made.

WASHINGTON—Constant hammering by the Joint Congressional Committee on Reduction of Non-essential Federal Expenditures finally knocked out costs of over $2,000,000 annually. This was done between Dec. 24, 1941, shortly after the United States entered the war, and July 25, 1942. By putting the axe to three depression-born alphabetical agencies, the Civilian Conservation Corps, and the politically odious WPA and NYA, a total of over $1,000,000,000 was saved annually. Like all government bureaus they fought fiercely for perpetuation. But powerful as were the forces to save them, their continued existence was made preposterous by the war.

Once bureaucracy has fastened itself on the payroll it seeks by every mortal means not only to stay there by puffing up its alleged importance but also to increase its size and power with rabbit-like multiplication. Unfortunately for the taxpayers, it too often is successful in making itself as nearly immortal as a human institution can be. When its existence is threatened it can, and always does, set up amazingly fantastic claims to show why its preservation is necessary. Whether merely a boondoggling or otherwise parasitic outfit, it tells of the dire things that will happen to the country if it is liquidated. That sort of chant has been heard ever since NRA, with its goose-stepping of business, was slugged to death in 1935 by the Supreme Court, much to the welfare of the nation and its form of government.

Nor has an outfit been pulled out of the thickly populated maze of government agencies and strangled to death either by choking off appropriations or by court decisions that it was not beneficial to the country. It has meant that much less regimentation of and irritation to business and the implications of federal control, to say nothing of costs to taxpayers. The difficulty is that these strangulations have been all too few.

THE tremendous waste of money and manpower at a time when the government is screaming about a shortage of manpower still flows from the vast bureaucracy of overlapping and unnecessary activities. The civilian payroll at the end of February was 2,827,839 or only 167,624 under its peak of 3,095,463 in June, 1943. Washington alone swarms with 265,000 federal employees. The Congressional Committee, modestly enough, is seeking an overall slash of 400,000, which is much too small.

Many bureaus are so overstaffed that it is not at all uncommon for employees with nothing but time on their hands to ask for their dismissal only to be denied certificates of availability by bureaucrats, zealous of their power and aware that in certain classifications the larger their personnel, the greater their income. The power a little bureaucrat can get is limited and is secondary to his more practical desire to make more money.

On the other hand, the department heads and cabinet officers whose salaries are fixed by law too often seek to bloat their personnel and activities for the glory of the thing. Some of Washington's "goriest" feuding among New Deal higher-ups has been caused by uncurbed ambitions to get into the limelight. The Wallace-Jones brawl over the BEW—now the FEA—and the Wallace-Ickes shillalah-swinging over control of the forest service are only a few of many examples of bureau-grabbing run riot, and of power seeking more power.

EVEN after reluctantly making mild reductions in their excessive personnel it is not at all unusual for departments and bureaus to bounce back and increase the number of employees, and today cries are going up from some bureaus for still more employees. This is not to say that some bureaus, considering the enormous jobs thrust upon them—jobs which in too many instances should never have been created—do not need more employees. An outstanding example is the over-burdened Bureau of Internal Revenue which has an almost impossible task of administering and interpreting the complicated revenue laws and collecting taxes from some 50,000,000 people. But these bureaus definitely are the exception.

The practice of adding to rather than reducing the payroll was exemplified in January, when according to the Joint Congressional committee,

M-6 TRACTOR: *This 38 ton, high speed, military tractor, the M-6, is more than double the size of the recently announced M-4. Built by Allis-Chalmers, this unit teams up with the new 240 mm. howitzer and the 8-in. (200 mm.) gun, making them the most formidable artillery weapons in action.*

the total number of civilian employees was 2,978,229, a net increase of 8951 over the December, 1943, total of 2,969,278. Naturally the War and Navy Departments have the largest number of employees but the Congressional Committee, like the public at large, think they are far too numerous. The War Department, leading all the rest, had 1,213,989 employees in January, a decrease of a mere 1125 under December, but some 270,000 more employees than were on the entire civilian federal payroll when it was at its peak in the first World War. The Navy Department added 11,243 employees to its payroll in January to raise its total to 719,917 from 708,674 in December. The sprawling Agriculture Department managed to cut its payroll by the small number of 661, while keeping 80,529, making enough for a fair-sized town by itself. The heaviest slash—and it certainly was not deep—was made by the Department of Commerce, which made a reduction of 1353, leaving it with 30,000 employees, equivalent to two military divisions.

THE Congressional Committee, pressured by a country-wide concern over unbridled extravagance and inefficiency, wants the government to streamline itself and really mobilize for war on the home front. The committee is not making nearly as much headway as it had hoped but it has served notice that it will continue to press for a widespread curtailment in expenditures, either voluntarily or by having Appropriations Committees do the trick, simply by denying funds to non-essential functions and calling a halt to the bureaucratic practice of shifting employees from one unnecessary activity to another.

"Nor is it enough to combine one group of offices with another, merely to erect a new superstructure at their head," admonished the committee, which is headed by Senator Byrd, Democrat, of Virginia. "Rather the value of each employee, each office, and each dollar expended must be consciously weighed in its relation to the welfare of the people of the nation. Agencies which have been built on years of depression must be abolished. The non-war activities of these establishments not devoted entirely to war work must be curtailed. Bureaucratic policies which sap the nation of both financial solidity and surplus of manpower must be eliminated. Only in so doing may the federal government do its part in preparing for an economically sound postwar nation.

"Thus the committee feels that just as it is the patriotic duty of all citizens to reduce their spending to a minimum, so it is even more the patriotic duty of the Congress of the United States to curtail irreducibly all non-essential expenditures. That the people will hold this Congress strictly accountable for all wasteful or extravagant appropriations which divert sorely needed funds from the war effort is self-evident. Consequently, it is hoped that Congress will continue to participate actively in this endeavor to provide a checkrein on run-away non-essential spending wherever it is found."

Eastern Aircraft Reveals Faster Version of "Wildcat"

Linden, N. J.

• • • **The existence** of a "wilder" Wildcat fighter plane was revealed this week by L. C. Goad, vice-president of General Motors and general manager of its Eastern Aircraft Division. This new version of the Wildcat, manufactured exclusively by General Motors, is designated the FM-2 and possesses performance characteristics not previously available in a small carrier-based fighter.

According to operational reports, this new fighter can climb faster than its predecessor, the FM-1, or F4F4, as it was known by Grumman, its original designer. Other improvements include a considerably shorter take-off and lower landing speed—both extremely advantageous aboard a carrier. The model FM-2 is powered by a hitherto unannounced Wright engine with a number of new features including forged cylinder heads in place of the usual cast heads. Despite sizeable increase in horsepower over the engine previously used, the weight has been decreased.

At a press meeting at which the Model FM-2 was announced, Rear Adm. D. C. Ramsey, chief of the Bureau of Aeronautics of the U. S. Navy, described the ship as the best fighter the Navy has. It outperforms anything of its size in the fleet. He disclosed that Eastern Aircraft is ahead of schedule on the production of both the Wildcat and the Avenger torpedo bomber and to date has delivered to the Navy more than 4400 combat planes since the first contract was placed in early 1942. The Eastern Avenger is the only torpedo bomber in full production for the Navy.

THE BULL OF THE WOODS — BY J. R. WILLIAMS

Meet "Flash" Jonesey, champ of the soap box derby. He built that job with his own two hands and his old man's basement tools. . . . He's the great American dream, and the hope of this cockeyed world.

For it's because America raises kids like Jonesey that America is winning this war. Kids who were weaned on mechanical toys, and cut their eyeteeth on tools. Kids who grew up to be the finest fliers and fighters, engineers and builders the world has ever seen. . . . And it's because of millions of kids like Jonesey that America will have a priceless legacy of the world's finest skills, after this war is won.

The responsibility to use those skills wisely and well is one of the greatest industrial challenges ever to face this nation.

If you are a manufacturer, there is one thing that you can do at once: Have your production men and planners consult now with the engineers of the basic machine tool producers. They can help you in planning ahead the difficult task of reconverting your own skills and machinery to an all-out peacetime production.

One of these engineers is a Bryant man — and his specialized knowledge of internal grinding machinery is important to the manufacture of literally *everything* that will mean jobs and prosperity after the war . . . that will make America's priceless legacy a new hope for the world.

BRYANT CHUCKING GRINDER COMPANY SPRINGFIELD VERMONT, U. S. A.

• Producers and processors of scrap suffer on side-lines as major California mill buyers further depress bids to $1.50 per ton below ceiling and WPB allocates 40,000 choice tons from shipyards to Chicago mills in 15 days.

SAN FRANCISCO—In the first 15 days of April additional allocations were issued by WPB in Washington for over 40,000 tons of creme-de-la-creme shipyard scrap from Pacific Coast maritime yards to be shipped all-rail on land grant rates to Midwest furnaces principally in the Chicago district.

Following an increasing volume of such allocations for a cumulative major tonnage over the past several months, West Coast scrap sellers, processors and buyers have passed from states of mild disturbance through perplexed aggravation to approaching frenzy, and strained relations between the Pacific trade and the scrap section of WPB are nearing dangerous stress.

Steadily accumulating shipyard scrap has augmented ordinary industrial sources and fairly consistent incoming shipments of overseas demolition material, providing a supply well in excess of any furnace demand. So major California scrap buyers about the first of the year bid and purchased only at a price of $1.00 below the ceiling. On this basis they felt able to maintain mill stock and reserves on a 30 to 90 day basis which, they stated, was all the market and prospects justified them in purchasing.

Since practically all shipyard scrap is owned or controlled by government agencies, WPB urged that sales below ceiling were not justified, and that if California and West Coast buyers would not pay the ceiling, markets must be developed elsewhere. Arrangements were therefore made and allocations placed to ship sizeable quantities to the Middle West by land grant rail rate. First shipments were on a basis of $10.08 per gross ton, for unprepared scrap f. o. b. cars. Adding a preparation charge of $3.50 on delivery and a trans-continental rail rate of slightly over $8.00, the scrap landed at Chicago furnaces at between $21.50 and $22.00. Once the Midwest got its eyes on and teeth into this shipyard scrap, its appetite was whetted. On the other hand, major California buyers, unhappy at the loss of so much good scrap, determined to put on further pressure. For April they further depressed the bid and buying price to $1.50 below ceiling base. Countering, WPB arranged scrap allocations on the basis of $12.77 per gross ton unprepared f.o.b. cars at shipyards, which is exactly the California ceiling.

Of this show-down contest that is developing between WPB scrap allocators in Washington and major California mill buyers, unfortunate victims are all West Coast scrap processors and producers and Pacific Northwest mill buyers. An increasing amount of processing and preparation is being done in the Midwest, since there is no preparation in transit on West Coast scrap for Midwest consumption. On the current price of $15.50 for prepared No. 1 melting scrap at the mill, the original producer received $10 or less, which tends to discourage movement and dry up ordinary sources and channels.

In the Pacific Northwest, traditionally a plus area, where the base for No. 1 heavy melting prepared at Seattle is $14.50, recent allocations to local mills have involved local rail hauls of from $4.50 to $5.50 freight per ton. When railroad scrap is included, taking a $2.00 advance under Admendment No. 14, with a $14.00 remote area minimum guarantee, allocated shipments frequently arrive in Seattle to cost mill buyers there in excess of $20 per ton, nearly 50 per cent in excess of the ceiling price. Allocated shipments to Seattle from the vicinity of Spokane or from interior points in Oregon, on which the Seattle and Portland mill buyers are charged the local freight, pass in transit the Eastbound allocated envied shipments from Puget Sound and Portland shipyards, destined to Chicago, moving at land grant rates.

Both OPA and WPB take the position that ceiling prices under present conditions should be minimum going prices also, and there seems to be some evidence of punitive intention toward all Pacific Coast buyers, to bring pressure to firm the market and restore ceiling prices. While Eastbound empty cars are available and while there is a supply of such good shipyard scrap that Midwest buyers will gladly pay a premium for it, the strained situation bids fair to continue.

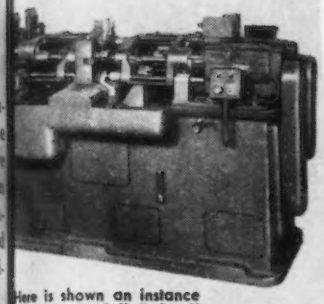
DURING the past 30 days more than 5000 tons of steel, copper and aluminum from surplus inventories were placed through WPB's Redistribution Division in 12 southern California counties, and turned back into trade channels for resale. In addition sales were negotiated for nearly $200,000 in fabricated materials including hardware, electrical supplies, building materials, rubber hose and cutting tools. Representatives of the Redistribution Division now go out as salesmen among war contractors to encourage the sale of materials in surplus inventories.

While the WPB Redistribution Division functions as coordinator and listing agency to bring buyer and seller together, the Treasury Department is building an organization actually to sell war plants and facilities as well as surplus materials, under the Baruch plan. Farsighted government men in this area seem to be transferring to this new agency of the Treasury Department as the most promising postwar and liquidation agency.

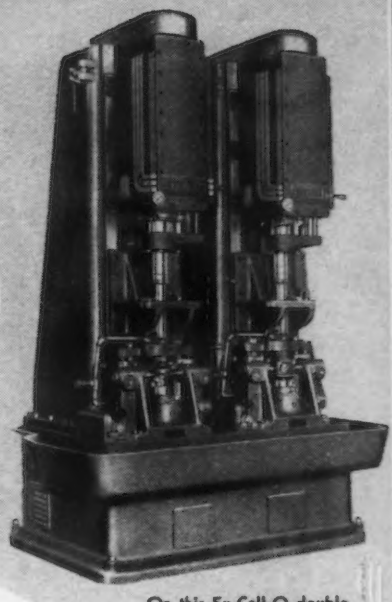
TO the current drive for young men under 26 by Selective Service, hitherto critical industries are preparing to contribute their generous all, even on the manpower-tight West Coast. From a single Pacific Navy Yard only 75 out of 2400

XLO

EX-CELL-O *for* PRECISION



Here is shown an instance where the Ex-Cell-O Small Hydraulic Unit (Style 21) is used on a machine for the accurate drilling of holes in oil pump bodies.



On this Ex-Cell-O double drill press, two Style 25-A Ex-Cell-O Hydraulic Units are mounted on the columns in vertical position. This has definite advantages on certain classes of work.

Plan Now for ECONOMICAL PRODUCTION!

Production Machines equipped with Ex-Cell-O Hydraulic Units have numerous advantages

For the machine you build, or the machine we build, the use of Ex-Cell-O Hydraulic Power Units provides these features:

They are compact, for proper design.
They are self-contained, for ease in installation.
They have infinite feeds, for proper cutting.
They have gear change, for proper speeds.
They have ample power, for multiple-head operation.
They have variable stroke, for greater flexibility.

Ex-Cell-O Hydraulic Power Units are standard and produced in quantities, but in nearly every case where the unit is used it becomes a part of a special, high production type machine for a specific operation. These units are economical because, as applications change, the units can become a part of the new machine even though entire base is redesigned.

The units can be mounted on any plane—horizontally, vertically, or angularly—on a temporary or a permanent base, and they can be arranged so that it is possible to use them in connection with guide bars and multiple drill heads.

Find out today how Ex-Cell-O Special Machines and Ex-Cell-O Hydraulic Power Units can fit your program for today's and tomorrow's production.

Where high production, accuracy, and economy through multiple operations are required—consult EX-CELL-O now

EX-CELL-O CORPORATION

DETROIT 6, MICHIGAN

SPECIAL MULTIPLE WAY-TYPE PRECISION BORING MACHINES • SPECIAL MULTIPLE PRECISION DRILLING MACHINES • PRECISION THREAD GRINDING, BORING AND LAPPING MACHINES BROACHES • HYDRAULIC POWER UNITS • GRINDING SPINDLES • DRILL JIG BUSHINGS • CONTINENTAL CUTTING TOOLS • TOOL GRINDERS • DIESEL FUEL INJECTION EQUIPMENT • R. R. PINS AND BUSHINGS • PURE-PAK CONTAINER MACHINES • PRECISION AIRCRAFT AND MISCELLANEOUS PARTS

present male workers under 26 will be henceforth deferred and from an important San Francisco Bay Maritime Yard only 50 out of 3800 will remain uninducted.

REPRESENTATIVES of small business firms at Seattle last week told a visiting Congressional sub-committee that they were being forced out of business and the sympathetic sub-committeemen, after hearing the testimony, pledged they would try to have Seattle removed from the critical labor area classification. West Coast aircraft, shipbuilding, Navy and manpower officials have their doubts.

Representatives of small plants claim that labor needs around Puget Sound have been greatly exaggerated, stating that Boeing hires only one out of every three applicants these days and has never hired anywhere near the 9000 originally requested. Boeing officials counter with the claim that they hired well over 9000 between last September and the end of February and that they still need 2000 more workers.

Other small plant witnesses claimed that when small war plants are closed few workers ever go to Boeing or the Navy Yard. Little fellows tell how they install special equipment for jobs and contracts that have been promised and proposed, but that now prime contractors install their own equipment and do the work themselves instead of sub-contracting it, thus leaving the little fellows high and dry after their investment of meager funds.

Ames Shipbuildng & Drydock Co., for instance, told of installing $30,000 worth of equipment for making shafting for Seattle-Tacoma's original 25 destroyers. For a new contract Sea-Tac installed its own equipment. When Ames hunted up a sub-contract for the Navy, the Navy soon afterwards installed its own equipment. Next Ames took on an Army job only to witness an Army installation of similar equipment.

In California Smaller War Plants Corp. reports that 2000 firms employing 500 or less are listed and that practically every one is using its facilities to the full extent of available manpower. A recent provision that $50,000,000 worth of sub-contracts on 78 AV-1 maritime vessels must be let to smaller war plants is a helpful factor.

New naval construction on the West Coast, involving contracts exceeding $250,000,000 was included in last month's Congressional appropriation. A preliminary estimate stipulates that 35,000 additional skilled workers will be required. A naval ordnance test station at Inyo-Kern, east of the Sierra Nevada mountains, is down for $40,000,000 with housing facilities, shops, laboratories, buildings, warehouses and general facilities. Another $60,000,000 will be spent in the San Francisco Bay area for expansion of naval air station facilities, installations, warehouses and harbor improvements.

Switch from B-17 to B-19 Under Way at All Boeing Plants

Seattle

• • • **Within the next** few months all plants of Boeing Aircraft Co. will be converted from manufacturing Flying Fortress B-17's to the production of new Superfortress B-29. For the past few months the newest Renton plant, near Seattle, and the Wichita plant have been turning out B-29's, each separately and at slow, preliminary pace, under wraps. Now that the longer range, more powerful, heavier armed B-29 Superfortress has been accepted, proved and standardized, feverish quantity production will commence.

In March, Boeing's two Seattle plants and six Washington branch plants combined to turn out an all-time record production of 362 four-motored B-17's, or a plane every 71 minutes. This record will never be broken, for these facilities now will be gradually changed over to sub-assemblies and component parts for the B-29. Final assembly will be concentrated at Renton and the two Seattle plants and six outlying branch plants will fabricate components and complete sub-assemblies. Body and wing members assembled at Seattle will be trucked to Renton on a new four-lane highway that will be constructed to connect two present highways so that a fleet of trucks can constantly connect the plants, some 10 miles apart. There will be no layoffs of personnel or shutdowns during conversion and ultimately present employment must be increased. Production of B-17's will gradually taper off and ultimately will be confined to the southern California Douglas and North American plants which have been producing a sizeable number of Fortresses these many months past.

New Tube Mill Scheduled To Produce in September

• • • **Pittsburgh Steel Co.** expects to put in operation, in September, the new automatic tube mill which is to replace its present No. 3 mill at Allenport and it will have a capacity of 10,000 tons per month. The capacity of their present mill is 4500 tons a month.

The new mill will manufacture seamless tubes 3 to 7½ in. in diameter. It is reputed to be the fastest mill of its type and size in the country according to the company. Closer tolerances on certain sizes of oil country casing will be possible.

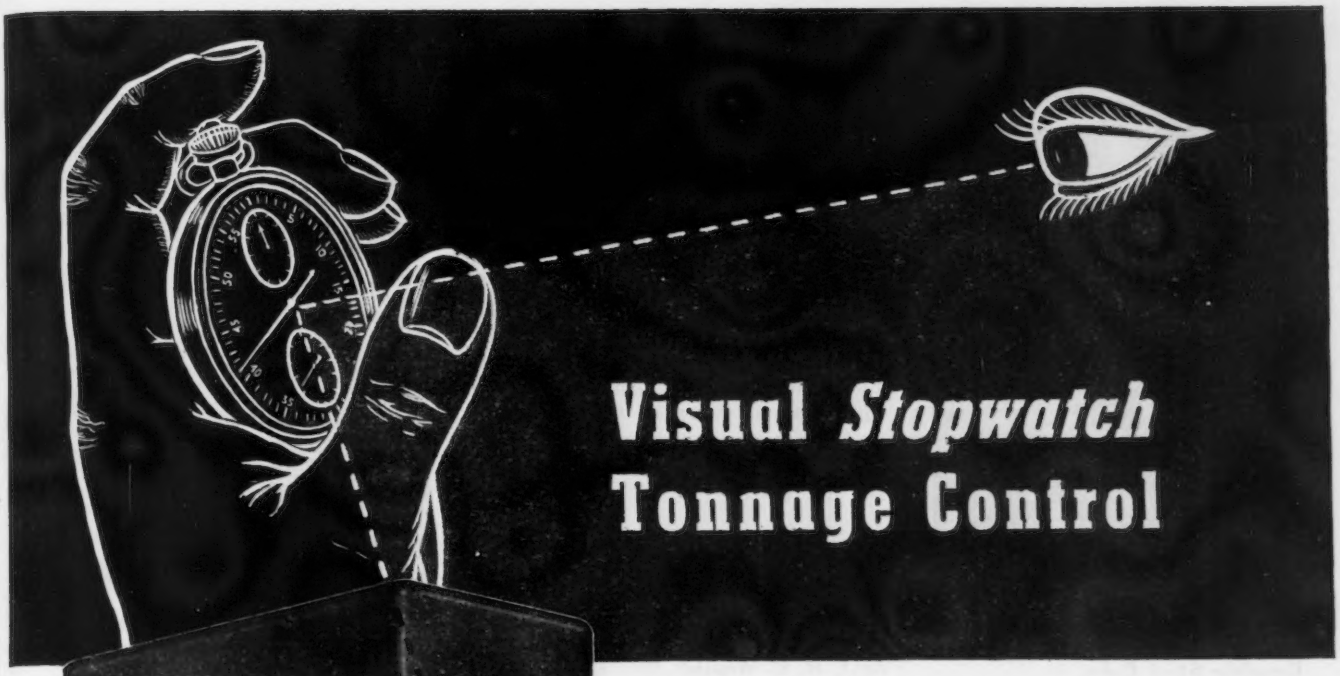
Metal Trades Association Postpones Annual Meeting

• • • **The National Metal** Trades Association, Chicago, has postponed its annual convention, scheduled for May 16-19 in New York. The administrative council tentatively proposed the convention be held this Fall if "the demands of railroad transportation lessen and the war situation permits."

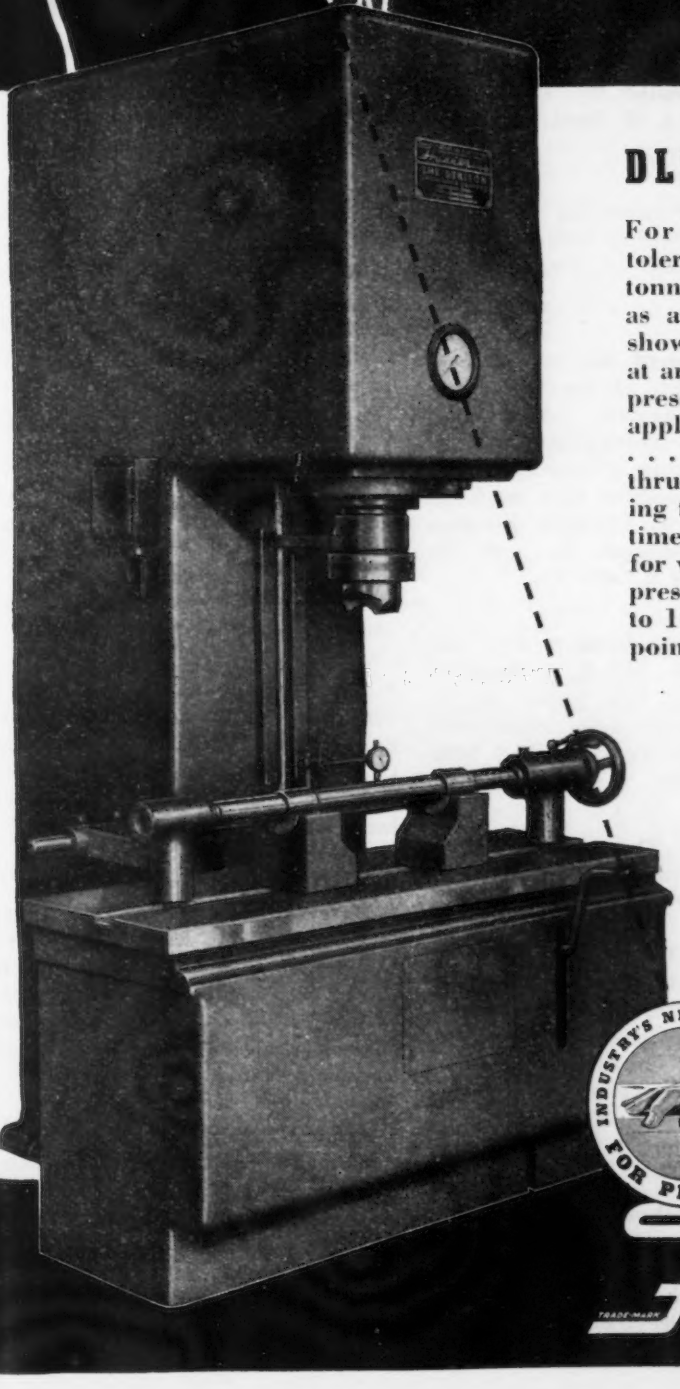
. . . Cited for Awards . . .

• • • **The following** companies have won the Army-Navy E award for outstanding war production:

M. P. Heinze Machine Co., Chicago.
Speed-O-Print Corp., Chicago.
Cooper-Bessemer Corp., Cleveland.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Trafford and Derry, Pa.; the Nuttall Gearing Division, Lawrenceville, Pa. (third star), and Buffalo District Mfg. & Repair Department, Buffalo.
Askania Regulator Co., Chicago (star).
Electric Storage Battery Co., Philadelphia (fourth star).
American Bridge Co., U. S. Steel Corp., Gary, Ind.
Briggs Clarifier Co., Washington (star).
Vincennes Steel Corp., Vincennes, Ind.
Chicago Bridge & Iron Co., Birmingham Plant, Birmingham.
Chicago Bridge & Iron Co., for work at U. S. Naval Drydocks, Morgan City, La.
Construction Machinery Co., Waterloo, Iowa.
Danly Machine Specialties, Inc., Cicero, Ill.
Enterprise Engine & Foundry Co., San Francisco Plant, San Francisco.
Industrial Gear Mfg. Co., Chicago.
International Harvester Co., McCormick Works, Torpedo Section, Chicago.
Kresky Mfg. Co., Petaluma Plant, Petaluma, Cal.
Naval Ordnance Plant (Amertorp Corp.), Forest Park, Ill.
Reichel & Drews, Inc., Chicago.
Sterling Engineering Co., Barkhamsted, Conn.
U. S. Hoffman Machinery Corp., Poughkeepsie, N. Y.



Visual *Stopwatch* Tonnage Control



DLSC2-150 HydrOILic Press

For time-saving precision on today's close-tolerance straightening jobs, this *HydrOILic* offers tonnage control that's as quick as the eye, accurate as a stopwatch. A glance at the pressure gauge shows the operator the exact tonnage being applied at any given moment — enables him to match the pressure to any job quickly, as he goes. He can apply pressures smoothly and evenly, or bit by bit . . . very slowly, or at full speed . . . in a single thrust, or in short repeated thrusts without waiting through a full stroke of the ram. He takes no time out for pre-set adjustments — unless desired for volume production operations. For such work, pressure limits can be fixed at any point from 15 to 150 tons, and the ram stroke can be set at any point up to maximum.

This *accurately controlled flexibility* is what makes HydrOILic Presses so advantageous for so many different types of work. And like all Denison HydrOILic Presses, this DLSC2 offers exclusive features for safety, convenience and economy of operation—extra toe space, highly compact and streamlined design, fully enclosed mechanism, and others. Also available in 25, 50, and 100-ton capacities. Presses for other needs are built in similar capacities. Write for complete information. The DENISON Engineering Co., 1158 Dublin Rd., Columbus 16, Ohio.

INDUSTRY'S NEW RIGHT HAND FOR PRESSING

DENISON EQUIPMENT *in* APPLIED HydrOILics

PERSONALS

E. B. WINNING, assistant to the vice-president in charge of operations, Republic Steel Corp.

• **E. B. Winning** has been appointed assistant to vice-president in charge of operations of Republic Steel Corp., Cleveland. Mr. Winning who has been manager of the company's Northern coal mines since 1933 will have supervision over all of Republic's mining operations. He will be succeeded as district manager by **J. L. Hamilton**, now assistant district manager.

• **N. A. Fitch**, formerly general manager, has been appointed vice-president of National Steel Products Co., Houston, Tex., a subsidiary of National Steel Corp. Mr. Fitch has been connected with steel warehousing distribution in the Southwest for many years.

• **Dr. Willis R. Whitney**, honorary vice-president of the General Electric Co. and first director of its research laboratory, has been made an honorary member of the Electrochemical Society. He is a charter member of the organization.

• **Erskine Ramsey** has been elected chairman of the board and general consulting engineer of the Alabama By-Products Corp., Birmingham; **J. W. Porter** was made president; **H. L. Morrow**, vice-president and treasurer; **J. A. Shook**, secretary; and **H. M. Cowart**, assistant secretary and assistant treasurer of the company.

• **R. W. Scobell** has been made New York representative of the Missouri Rolling Mill Corp., St. Louis.

• **O. Onsrud** has been appointed chairman of the board of the Onsrud Machine Works, Inc., Chicago; R. F. Onsrud was made president and general manager, and J. Knox, secretary.

• **Arthur W. Hedgren** has been made general manager of sales, the H. H. Robertson Co., Pittsburgh. Mr. Hedgren was manager of Q-Floor sales and Chicago district sales manager. He will direct the sales of all Robertson products.

• **E. G. Bailey**, former president and company founder of Bailey Meter Co., Cleveland, has been elected chairman. **Robert S. Coffin** succeeds him as president; **R. E. Woolley**, was elected vice-president and **J. H. Black**, secretary-treasurer.

• **Avery H. Stanton** has been made technical engineering consultant with Magnus Chemical Co., Inc., Garwood, N. J.

• **Morgan Buford** has been named factory manager of the Globe-Wernicke Co., Cincinnati. For the past 22 years, Mr. Buford has been engaged in factory management and engineering capacities with the Rock-Ola Mfg. Corp., Chicago; Florence Stove Co., Kankakee, Ill., and the Anaconda Wire & Cable Co.

• **Dr. R. D. Evans**, formerly with New Jersey Zinc Co., and **E. A. Bruce** of Blaw-Knox Co., have joined the research and development department staff of the Pennsylvania Salt Mfg. Co., Philadelphia.

• **Dr. John F. Thompson**, executive vice-president of the International Nickel Co., New York, has been awarded the 1944 Egleston Medal of the Columbia University Engineering Schools Alumni Association for distinguished engineering achievement. He became associated with the International Nickel Co. 38 years ago and as metallurgical engineer on the administrative staff, started the company's first technical department.

• **Paul C. Nicholson**, president of the American Screw Co., Providence, has been made chairman of the board, and **Eugene E. Clark**, president. Mr. Clark was formerly vice-president and general manager.

ROBERT S. ARCHER, metallurgical assistant to the vice-president, Climax Molybdenum Co.

• **Robert S. Archer** has joined the Climax Molybdenum Co., New York, as metallurgical assistant to the vice-president. In 1930 Mr. Archer became director of metallurgy for A. O. Smith Corp., Milwaukee, and since 1934 had been chief metallurgist of the Chicago district of Republic Steel Corp.

• **Dr. William A. Pennington** has joined the research staff of the engineering division of Carrier Corp., Syracuse, N. Y., and will devote himself to Carrier's metallurgical and chemical problems.

• **Samuel M. Stone**, formerly president, has been made chairman of the board of Colts Patent Fire Arms Mfg. Co., Hartford. **Graham H. Anthony**, formerly president of Veeder-Root, Inc., has been made president to replace Mr. Stone.

• **Harry E. Smith**, general manager of the Manhattan Rubber Mfg. Division, Passaic, N. J., and **Robert B. Davis**, general manager of the Raybestos Division, Stratford, Conn., have been elected vice-presidents of Raybestos-Manhattan, Inc.

• **Edgar K. Mull** has been appointed chief metallurgist for Barium Stainless Steel Corp., Canton, Ohio. Mr. Mull previously served in metallurgical capacities at Rustless Iron & Steel Corp., Baltimore; Bendix Radio Division, Baltimore; Darlington Rustless Steel & Iron Co., Ltd., Darlington, England.

FRED H. MARKWICK, general plant manager of the manufacturing division, The Sheffield Corp.

GORDON LEFEBVRE and FRED V. GARDNER have been elected directors of the National Tool Co.

• **Fred H. Markwick** has been appointed general plant manager of the manufacturing division, The Sheffield Corp., Dayton, Ohio. Mr. Markwick became a member of the Sheffield organization in 1917 and for the past several years has been plant manager of the gage manufacturing division. His new position will include supervision of all factory production.

• **Roger F. Waindle** has become general manager and chief engineer of Alloy Casting Co., Champaign, Ill. He succeeds **L. M. Lindsey**, who has been named co-manager of the Detroit office of General Alloys Co., Boston, Mass.

• **J. J. Pugh** has been made vice-president in charge of all sales activities of the Walter Maguire Co., Inc., New York.

• **John S. Case** has been made factory manager of the Baltimore plant of Anchor Post Fence Co. Before joining the company in 1936 as assistant engineer in the heating division, Mr. Case was associated with Robbins & Myers, Inc., Springfield, Ohio.

• **K. T. Vangsnes**, formerly vice-president of Magnesium Products, Inc., Los Angeles, has joined the magnesium sales division of the Dow Chemical Co., Los Angeles office. **W. R. Dixon** has been appointed assistant manager of Dow Chemical Co.'s plastic engineering division, Midland, Mich. He joined Dow in 1936.

• **Gordon Lefebvre**, president and general manager of Cooper-Bessemer Corp., Mt. Vernon, Ohio, and **Fred V. Gardner**, head of Fred V. Gardner & Associates, Milwaukee, have been elected directors of National Tool Co., Cleveland. Mr. Lefebvre was formerly connected with E. I. du Pont de Nemours & Co., General Motors Corp. and the American Locomotive Co. Mr. Gardner is president of Smith Steel Foundry Co. and a director of T. L. Smith Co., Milwaukee.

• **E. S. Weidle** has been appointed vice-president in charge of sales, and **Walter White**, vice-president in charge of production of the Pittsburgh Steel Foundry Corp., Glassport, Pa. Mr. Weidle was formerly general manager of sales, and Mr. White was plant manager.

• **Cecil W. Armstrong**, formerly senior research engineer of Lockheed Aircraft Corp., and chief engineer of Marco Chemicals, Inc., Sewaren, N. J., has been appointed chief development engineer, plastics division, Continental Can Co., Inc., New York.

• **Paul L. Goldstrohm** and **George M. Muschamp** have been elected members of the board of directors of the Brown Instrument Co., Philadelphia. Mr. Muschamp is vice-president in charge of engineering of the Brown Co., a division of Minneapolis-Honeywell Regulator Co., and Mr. Goldstrohm is vice-president in charge of production.

• **Edward A. Ulrich** has been appointed to the new post of technical director of the Niagara Filter Corp., Buffalo. He has held sales and engineering positions for five years.

• **W. R. Swoish** has been appointed sales manager of the Pennsylvania Transformer Co., Pittsburgh. He will have full charge of all sales activities.

• **Frank D. O'Neil**, formerly treasurer of Western Foundry Co., Chicago, has been elected vice-president in charge of manufacturing and **J. P. Wright** has been made vice-president in charge of sales. **L. W. Austin** succeeds Mr. O'Neil as treasurer; **J. D. Nigh** becomes secretary, and **J. O. A. Johnson** has been named assistant secretary and assistant treasurer.

OBITUARY...

• **Hugh W. Spaulding**, secretary of Handy & Harman, New York, died on March 31.

• **Karl O. Nelson**, for the last 25 years works manager for the Galland-Henning Mfg. Co., Milwaukee, died April 1 at his home.

• **Gilbert V. Egan**, treasurer and assistant secretary of the Nash-Kelvinator Corp., Detroit, died April 9, at the age of 52. He had been with the Kelvinator corp. since 1927.

• **John E. Conley**, 69, president and founder of the Conley Frog & Switch Co., Memphis, Tenn., died March 26.

Fatigue Cracks . . .

BY A. H. DIX

Outgunned

• • • The inhabitant of the adjoining cell, Frank Joseph Oliver, your favorite family journal's technical editor, just dropped in to show us what a manuscript looks like after running the Navy censorship gamut. Markings reveal that the guards are three. The first is armed with a 1-in. lead pencil, the second with a 5-in. red crayon, and the last with a 16-in. fountain pen.

The outer guard seems to have the bird dog job of flushing critical passages and pointing them out with a pencilled question mark. In the manuscript Frank showed us, a paragraph unflattering to the Navy was dutifully queried in pencil, and then firmly crossed out in red pencil. But nevertheless it will meet your eye soon, for the heavy gun outranged the one and two-stripers by inking a bold "Stet!" in the margin.

No Wrinkles

Like Zorina's tights, certain words fit their subjects perfectly. "Stet" for instance. It has the unyielding quality of an impacted wisdom tooth, and we would like to pin a posthumous rose on whoever invented it to denote "Let it stand!"

"Stet" Breaks Bonds

• • • "Stet" is too potent a word to be used only for proofreading, and we predict that it will soon seek fresh pastures. This is a prediction after the fact, for "Deac," who reads everything, sends us a clipping from the *Art Digest*, announcing the re-election of the New York Metropolitan Museum of Art trustees, headed "MET OFFICERS STETTED."

Birth Of an Adverb

• • • Our own brains department is itself no slouch at coining words, especially in these days of paper shortage. Latest product of our etymological mint is the eighth word below:

Standard steel pails will soon be utilized routinely by Jack & Heintz . . .

"*Routinely*," though admittedly no beauty, and even slightly emetic when first encountered, is the quickest way of saying "in a routine way." It permits a 44 per cent space-saving and should therefore be looked upon as a cross to be borne in wartime, like the cream cheese Childs' serves instead of butter.

Sunny Pittsburgh

Your statement that sunless days in Pittsburgh are far greater than in other cities is not "according to the record," as we recall it. If you doubt it we will have Mr. Brotzman of the Weather Bureau send you a certified copy of his usual remarks on the subject.

The word "smog" (smoke plus fog) was coined here.

—*Tom Campbell, Pittsburgh*

Even though the second paragraph fights the first, and even though Mr. Brotzman is probably under the thumb of the local Chamber of Commerce, and even though we will gamble that Pittsburgh is a dud territory for smoked eye glass (non-industrial) salesmen, we apologize, as we have many important advertisers in the friendly city.

Sunlit Prose

• • • Another reason we back down is because prose as colorful as this, lifted from a recent Jones & Laughlin (Pittsburgh) advertisement, could never have come from an area where children know of the sun only by hearsay:

Like wisps of fog, soft blue haze arises from the gutters while molten iron flows inside their sand-made banks, gurgling and sparking as it hurries to ladles . . .

Flowing iron spurts and spatters molten drops when the cast comes to an end. The air blast throbs and pulsates. The furnace breathes heavily like a winded monster. The escape valve, released by the blower, roars thunderously.

. . . the iron is on its way . . . to become steel, spearhead of invasion, measure of freedom . . .

The gorging big stacks, during long hours between casts, stand purring and hissing . . .

Stopper

• • • Sure 'Tis "Rafferty" I Call When I Need Steel" — *T. J. Rafferty. & Co.*

Hear, Hear!

• • • Lin Lin is the signature on a letter we just got from the Chinese News Service, which, we are sorry to say, is located in New York instead of in Walla Walla. It would have been nice, too, if the letter had asked us something about waste waste, a Chinese import, instead of referring to the Mar. 16 article, "China's Infant Industry."

We have no reason for believing it was typed by Simone Simone, but can hope that Mr. Lin Lin is one of those individuals who, when asked "How're tricks?" says "So so."

Delete "Club"

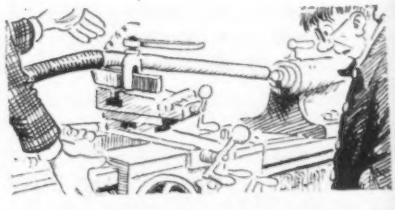
In a recent issue you referred to the Union League in Philadelphia as the "Union League Club." This will cause extreme irritation. "Union League" is enough.

—*W. L. B.*

"Union League" is entirely adequate and "Club" is redundant. We congratulate the Philadelphia organization on its economy, and as punishment we will erase "Club" from the blackboard 100 times.

But our file of out-of-town phone books reveals that only in Philadelphia is "Club" incorrect. In New York, Chicago and San Francisco "Union League Club" is the proper style.

Bouquet With Bee



You will have to take the "Bull of the Woods'' dad in hand. His characters are superb and incomparable, but the cutting tool tip in the Mar. 16 cartoon is about 4 in. above center and is 6 in. or so beyond the center-to-center line. Regardless of whether the rod was chucked or dog-driven, it would have pulled out of the tailstock center.

—*O. H. Niendorff, American Brass Co.*

We passed the complaint along to J. R. Williams and all he did was to flash his artistic license renewal for '44.

Connecticut Columbus

• • • Miss Vivièn Kellems, who discovered that people don't like to pay taxes, now finds that women are sick of war. This, we think, is an understatement. So are men, especially soldiers.

Problems

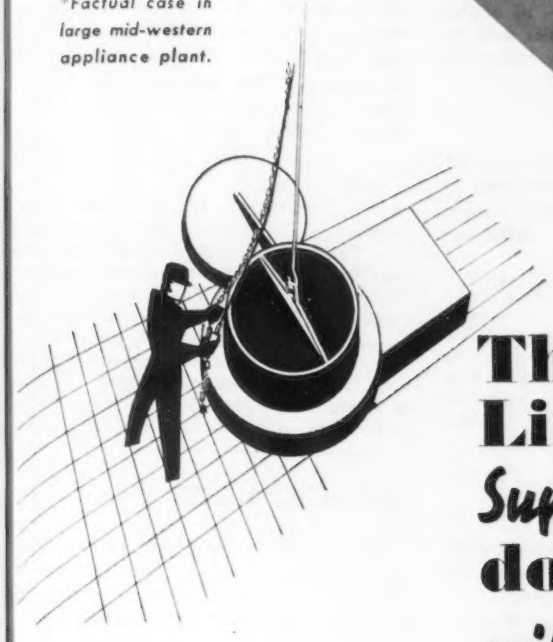
As you saw at a glance, 40 is the answer to last week's geese and gander puzzle.

Anything less than a half hour for this gets you an A plus in math:

Four men, Peter and Paul and their sons, Tom and Dick, buy books. When their purchases are completed it turns out that each man has paid for each of his books a number of dollars equal to the number of books he has bought.

Each family (father and son) has spent $65. Peter has bought 1 more book than Tom, and Dick has bought only 1 book. Who is Dick's father?

*Factual case in large mid-western appliance plant.



The Lindberg *Super-Cyclone* doubled output* *with all this saving in space!*

The principle of forcing hot air through the charge at high velocity gives many advantages to the Lindberg Super-Cyclone Furnace.

Take floor space: For normalizing grey iron castings, one plant loaded them into the basket of a single Super-Cyclone, then heated and dumped, doing the work in 8 hours which had required 8 box type furnaces and 16 hours. *The Super-Cyclone did 12 times the work per square foot of floor space.*

The fan-driven air, pre-heated in an isolated chamber, builds up temperature with rapid uniformity *throughout the charge* to anywhere between 300° and 1750° F., with accurate control. There is no radiant heat to cause distortion.

This revolutionary heating principle keeps work straighter, saves time and space and production costs. Besides, the Super-Cyclone can be used either for normalizing or annealing, for hardening or for tempering.

Write for complete information about this money-saving, time-saving, space-saving furnace, to Lindberg Engineering Company, 2452 W. Hubbard St., Chicago 12.

With the charge confined to a small area, fan-driven hot air at high velocity permeates the entire charge evenly, practically eliminating distortion, saving a great deal of space, and allowing quenching of the entire load without removal from the fixture.

LINDBERG FURNACES

ARMY E NAVY

SUPER-CYCLONE for hardening, normalizing, annealing, tempering
CYCLONE for accurate, low-cost tempering and nitriding
HYDRYZING for scale-free and decarb-free hardening

Dear Editor:

SOLVENT DEGREASING

Sir:

This is in answer to a letter by G. W. Walter of Detrex Corp. which appeared on last week's "Dear Editor" page, commenting on my article on solvent degreasing in your Mar. 9 issue:

Articles in medical journals or chemists' reports never reach the operators or their foremen. I wrote the article for our operators. I included enough "hearsay" discussion to persuade them to be careful. It worked here.

The figure on the vapor density of triclorethylene should, of course, have read 4½ times heavier than air instead of 5½.

The government cut us 30 percent on the use of solvents. We were told by salesmen we could buy no new machines.

As to my statement, "some people, especially Negroes, should not handle it (triclorethylene) at all," there is no basis for the statement that I know of. But I think it is true. The physical condition of many people forbids them from being degreaser operators.

The statement that triclorethylene vapors combine with nicotine to produce a third acid is by du Pont. Triclorethylene salesmen called our attention to it. Most texts contain it.

Anyone who works around metals knows that oily hands will rust steel and some men's hands more than others. ("Oily" in shop language is synonymous with "sweaty."—Ed.)

Every operator gets "burned" hands. There seems to be no permanent effect, and some people get it worse than others.

I do not think that hot solvent degreasing needs defending. It works quickly and under proper supervision should give no dangerous results. I think the machines and solvents are satisfactory. But we found here that without supervision, the best of them caused too much trouble. I have no controversy over chemical questions. The need is proper supervision.

H. H. HINES

Springfield, Vt.

NON-DESTRUCTIVE TEST

Sir:

Do you know of any quick, non-destructive test for distinguishing stainless steel springs from piano wire springs? We are faced with the problem of checking springs of identical design but of different materials.

F. MARTINDELL,
Production Engineer
Guardian Electric Manufacturing Co.,
1400 Washington Blvd.,
Chicago 7

● An ordinary magnet is the usual method of determining the common austenitic grades of stainless, inasmuch as they are non-magnetic. However, even these grades when cold drawn to springs frequently become magnetic. Stainless can be detected by a modification of the Preece test. Immerse a sample of the material in a copper sulphate solution for two minutes. On drying, ordinary steel will have a copper coating whereas stainless retains its bright color. Allen B. DuMont Laboratories, Inc., Passaic, N. J., makes an electronic unit that distinguishes various metals and alloys by analyzing their magnetic characteristics and recording them on a cathode ray tube.—Ed.

ELECTRONIC SORTING

Sir:

We have noticed reference in your publication to radio-like apparatus to identify composition of steel alloys. Where can we obtain further information?

C. C. ERICSON,
Purchasing Dept.
Rockford Screw Products Co.,
Rockford, Ill.

● The "Cyclograph" is described in the article, "Electronic Sorting & Testing Machine," Nov. 4, 1943, Iron Age, page 57. For further data write to Allen B. DuMont Laboratories, Inc., Passaic, N. J.—Ed.

CERROBEND DIES

Sir:

Your Mar. 2 issue has an article, "Drop Hammer Dies Made from Cerrobend." Who makes cerrobend?

LEO HOROWITZ
National Silver Co.,
432 12th St.,
Brooklyn 15, N. Y.

● Cerro de Pasco Copper Co., 40 Wall St., New York.—Ed.

GALVANIZING WELD

Sir:

Your Mar. 16 "News Front" refers to a new alloy, "Galv-Weld," for restoring galvanizing burned off during a welding operation. Where can we obtain this material?

F. FARRAR
Krengel's, Inc.,
210-220 Second Ave., So.,
Twin Falls, Idaho

● From Galv-Weld, Inc., Dayton, Ohio.—Ed.

STAINLESS SCRAP PRICES

Sir:

You did not quote prices fixed by O.P.A. stainless steel scrap. Can you tell us what these prices are?

I. KAUFMAN
David Kaufman & Sons Co.,
Bayway, Elizabeth, N. Y.

● We do not carry these quotations because they are highly specialized and lengthy, dealing with a considerable variety of specifications. They can, however, be obtained from any O.P.A. office. Ask for steel scrap price schedule 8.—Ed.

RATHENAU NO NAZI

Sir:

In the essay, "Under Three Plans" (Apr. 6 IRON AGE, page 47), you mention the name of Walther Rathenau who way back around 1900 wrote about the economic changes we are going through now and very likely will be for the next 10 to 20 years.

I do not know whether his book, "Of Coming Things," has ever been translated into English. If not, it should be.

Of course, it would be entirely wrong to think of him as a man building up some kind of Nazi economics. He was president of the German General Electric Co. and in organization and especially in his outlook for the possibilities of aluminum way ahead of his time. He had nothing whatever to do with the Hitler movement and was killed, when being Foreign Secretary of the German Republic, by those who afterward styled themselves "Nazis."

L. M. DINKEL
150 East Ave.,
Norwalk, Conn.

● The author of "Under Three Plans," Ralph Vaill, of Open Hearth Combustion Co., Chicago, did not align Rathenau with the Nazi party, but stated that Rathenau initiated many State Planning rulings upon which the Nazi party super-imposed the Soviet technique in order to prepare Germany for war. Two of Rathenau's books have been translated into English, "In Days to Come" and "New Society." The former is probably a translation of "Of Coming Things."—Ed.

SYNTHETIC RUBBER SPRAY

Sir:

Please send complete information on spraying of metal products with Thiokol synthetic rubber, mentioned on page 85 of your Mar. 30 issue.

W. GROSSMAN,
Mfg. Eng.
Electrolux Corp.,
Forest Ave.,
Old Greenwich, Conn.

● In the application described, synthetic rubber is sprayed on a propeller shaft, while in position on the ship. The molten rubber hardens rapidly to form a firmly-bonded coating with high abrasion resistance. The main research laboratory of Thiokol Corp. is at Trenton, N. J. The Schori Process Corp. of Long Island City, N. Y., did the spraying.—Ed.

MANPOWER SHORTAGE

Sir:

Will you please send me as quickly as possible any information you have regarding the current manpower shortage. Refer me to any article on the subject.

JOSEPH J. McMAHON
7 Belmont St.,
Lowell, Mass.

● See practically any issue of The Iron Age or any other industrial journal, or any newspaper.—Ed.

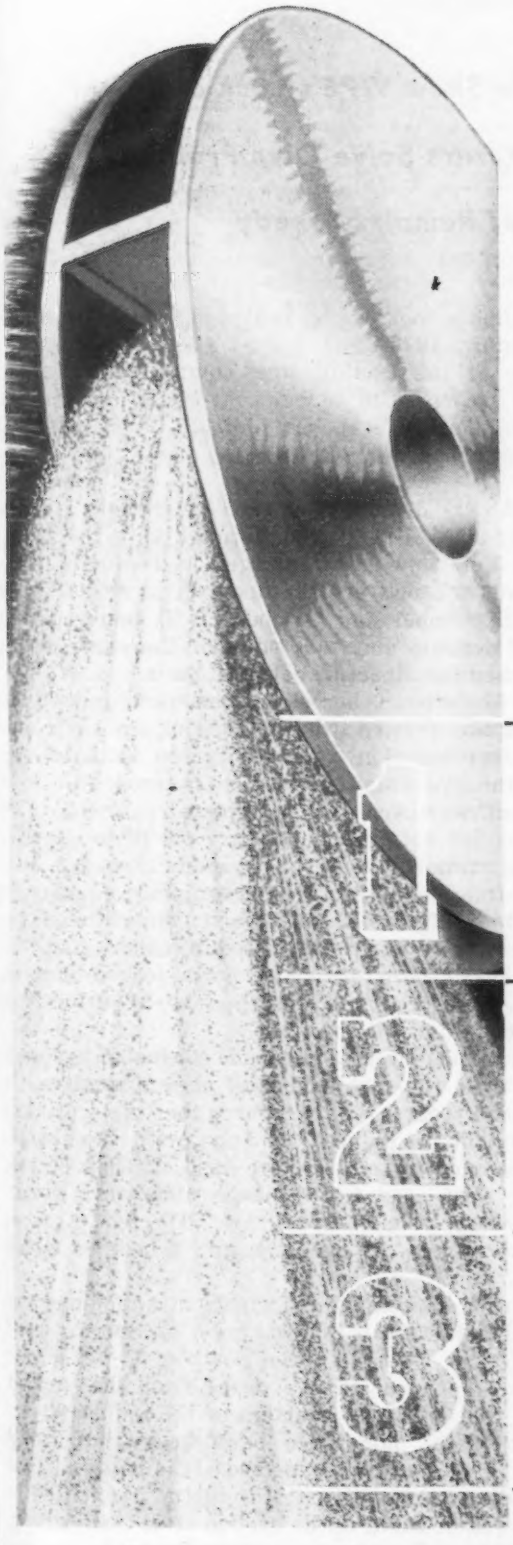
MIDGET STEEL PLANTS

Sir:

I would like to get names of firms that sell furnaces, to melt down scrap iron, to make angle iron fence posts for big farms.

ARTHUR V. LEY
Ley Brothers,
La Plata, Md.

● Any of the electric furnace manufacturers can accommodate you, but melting is only part of it. The steel still has to be rolled. Others who have tried making steel in homeopathic doses have found it cheaper to sell the scrap and buy the steel ready made from warehouses or mills.—Ed.



Barrage Against *Time*

EVERY production operation represents a closely calculated MEASURE OF TIME. In metal cleaning, the time factor is usually responsible for high costs. It is the important element to watch.

As time is cut, costs are cut also. The airless Wheelabrator lays a veritable barrage against time. It saves machine and labor time on cleaning, inspection, machining and grinding time.

Its cleaning action is consistent . . . the finish is uniform . . . there is less fluctuation in production . . . therefore, present and postwar contracts can be estimated more closely and at a lower figure.

More and more manufacturers are leveling a barrage at time costs by replacing outmoded methods of metal cleaning with the Wheelabrator. In planning for highly competitive postwar markets consider the advantages of this modern method as reflected in the following statements of users:

1

SAVED ON TIME

"Reduced cleaning time approximately 50%."
"5 hours' former cleaning time reduced to 15 minutes."
"60 man-hours of cleaning time reduced to 7 man-hours with the Wheelabrator."
"32 hours' cleaning time reduced to 7 hours."
"Time cut from 24 hours to 8 hours."
"We are cleaning castings in half the former time."

2

SAVED ON COSTS

"Reduced direct labor cost 50%."
"Saved 300 cubic feet of air per minute."
"Saved 75% of our labor in cleaning."
"Low cost per ton, in fact lower than we have ever cleaned castings before."
"Cleaning now with 4 less operators."
"Maintenance costs are 1/3 of sandblasting equipment."
"Our electric bills have been cut almost in half."

3

SAVED ON MACHINING, GRINDING, INSPECTION

"Decided increase in tool life between grinds."
"Considerable saving in grinding and grinding wheel costs."
"Wheelabrating shows up any minor surface imperfections."
"Considerable saving in our Machine Shops, from extra tool life."
"Tool wear and breakage materially cut down."
"Appearance and machinability are much improved over tumbled casting."

WHEELABRATOR AIRLESS ABRASIVE BLAST CLEANING

THE AMERICAN WHEELABRATOR

For more information, write to:

AMERICAN FOUNDRY EQUIPMENT CO.

510 S. Brykit St., Mishawaka, Indiana

This Industrial Week . . .

- ***Auto Industry's Conference Seems to Show WPB's Lack of Power***
- ***Canada Attempting to Let Manufacturers Solve Own Problems***
- ***Demand for Steel High; Ingot Output Remains Steady***

PRODUCTION of all items urgently needed for the invasion proceeded at high speed over the nation this week, but still the problems of contract cancellation and reconversion, manpower, and surplus property remained very active. The automobile industry's conference on Monday at Washington brought the difficult subjects to the forefront.

The meeting seemed to emphasize WPB's lack of legislative power to deal with the broad problems. Automobile men were requested to return in 60 to 90 days with plans for restricted production of 2,000,000 cars and subsequently for unlimited production, and to have in hand much other data. WPB Chairman Nelson said he would go before the Senate Postwar Committee April 19 to discuss the need for new legislation for WPB.

Last week Nelson appeared to be veering toward a little more determination on the wildly booted reconversion and civilian goods questions. He formaily announced his new reconversion policy committee and said that the restrictive order confining new or increased civilian production to Group III and Group IV labor areas would be modified. There was even talk that WPB will attempt to get the 2,000,000 electric irons originally programmed.

Meanwhile, in Canada officials of the Wartime Prices and Trade Board are reported to have agreed on principles which will result in the smoothing of the conversion problem. In the main, it is planned that industries will make their own decisions about civilian output, while no attempt will be made to judge between the relative urgency of consumer needs. No advance information of an intended relaxation will be given manufacturers, nor will there be postponement of these orders so as to provide equality of opportunity for manufacturers.

Steel ingot production is holding at its high level, the national rate this week being estimated at 97 per cent, identical with last week, and delivery promises and rolling mill schedules seem to be growing tighter steadily. On some leading items mill books are closed virtually through next October. One Middle Western mill reports its bookings on heavy gage sheets are now into February, 1945.

Some of the leading steel companies find their order volume eight to 10 per cent ahead of a month ago, while one firm's booked tonnage is estimated at 20 per cent ahead of a year ago.

INCREASED demand for shells, especially in the heavier sizes, is expected to accentuate the tightness of billets and certain large sized rounds. One large producer's delivery promises on large bar sizes are now September and October. It is believed that shell steel demand may take some of the space which could be used for structural steel or rails.

Like numerous other steel consuming industries, canmakers are worried over the outlook for their raw material supplies. The amount of food available for canning this year is expected to exceed the 1943 amount, but canmakers are perhaps more dubious over the outlook for obtaining necessary tin plate supplies than at any time since the war began. They are wondering if they should notify packers that there may be a shortage of cans. First quarter tin plate allocations were cut below stated requirements and the shortage hasn't been made up. It is feared that on July 1, the industry's inventory may be 4,000,000 base boxes short.

Considerable interest and some confusion has been centering upon the realinement of plate directives. It is understood from a reliable source that plate production loads will be reduced in July, with some companies scheduled to receive more of a cut than others, depending upon past performance and other conditions. However, sheet orders are expected to more than fill up any vacant space on mill schedules which occurs.

According to reliable information, announcement of upward adjustments in the price of certain steel products by the OPA has been postponed. No action will be taken for some time, judging from the current opinion in well informed quarters of the industry. Increases on plates, hot rolled bars, heavy hot rolled sheets, and rails had been expected. It is believed that OPA is still convinced the steel industry is entitled to such price relief, based on its carbon steel cost survey, and therefore adjustments eventually may be announced, with decreases perhaps in a few other items, principally war items.

APPROXIMATELY 21,000 tons of finished steel was estimated to have been lost in a three-day strike of crane men and hookers at Gary late last week. The strike forced 3200 employees into idleness on the bar, structural and strip mills.

Testimony of the steel industry before the WLB in the steel wage case has been postponed until next Tuesday, April 25, allowing the Steel Case Research

News Highlights in This Issue

"Civilian" Items Not Always for the Public

Pittsburgh

• • • Statistics and releases from WPB, purporting to show that certain amounts of civilian items, such as bedsprings, pails, garbage cans, ice boxes, etc., are being produced and are going to Mr. Average Man, appear to be statistics and nothing else, according to authoritative opinions here. Furthermore, tonnages of steel, which are going to agencies such as the WPB Vice Chairman, although appearing to be for civilian endeavor, are in most cases being used for war or by closely associated war industries. Actual figures, showing monthly tonnages of steel which are going to the Office of Civilian Supply, are far less than the proverbial drop in the bucket, according to actual analysis.

The reaction of some people on the home front to WPB releases, enumerating the number of civilian items which have been made or which will be made, has brought the question, "Where are they?" many times from the average person who has been accused of not knowing too much about the war. It is believed on good authority and after actual checking, that most of the bedsprings, ice boxes, etc., which are classified as civilian items, and which are being made by permission of the WPB, have gone to the Army, the Navy, State hospitals, other government hospitals, or for uses directly connected with the armed forces. Large tonnages of steel, which have been allocated by CMP for the agency known as the WPB Vice Chairman Group, appear, upon analysis, to have gone for products or repairs to plants or things closely connected to the war industries.

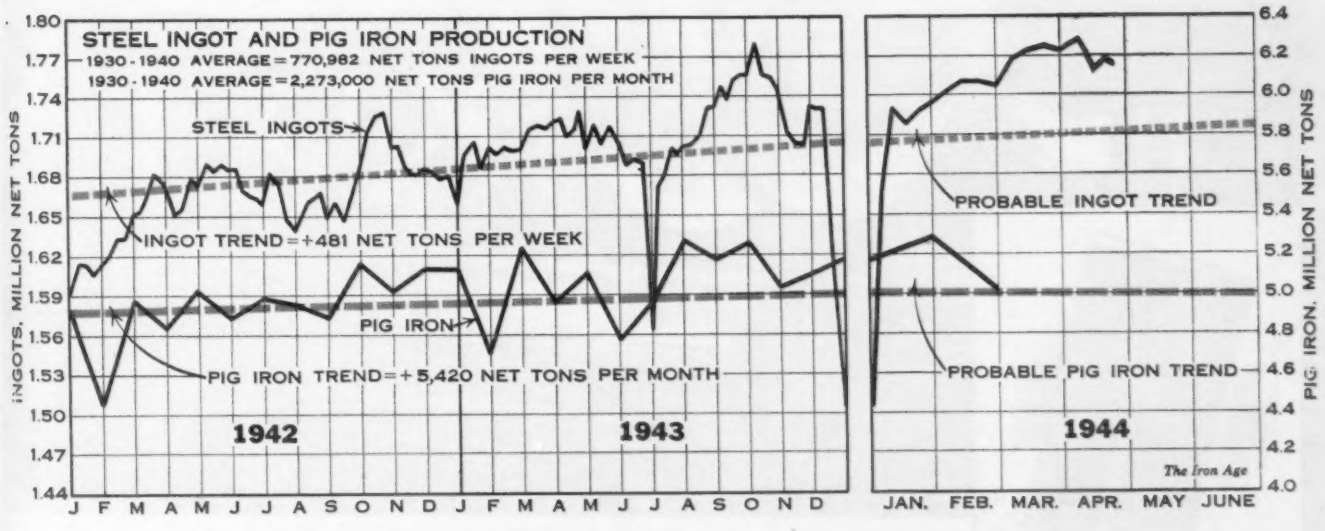
According to opinion here, the loose use of the term "civilian" is at the bottom of most misunderstandings. Essential civilian items or industries, such as railroads, oil and gas, utilities, farm, etc., are by no stretch of the imagination closely connected by ordinary civilian endeavor. Any steel or other products going to these groups are purely vehicles for supporting the war and its requirements. The actual amount of steel and other products going to strictly ordinary civilian use is, it is believed, far below what any public figures would seem to indicate, and it is expected that this will be the case for some time.

Committee more time to prepare its side. Meanwhile, the committee issued a booklet for public distribution which points out how government officials have stressed the necessity for "holding-the-line," how the union reversed its position on wage increases, and how average hourly earnings of steel workers have risen from 84c. prior to the invasion of France to $1.15 in January of this year.

Other highlights include: Modification of the Anglo-American lend-lease agreement to allow a return to normal trading when the war permits it; a report that the War Department is considering placing war industries on two 10-hr. shifts instead of three eight-hour daily shifts; and a proposal by Secretary Harold L. Ickes that government-built war plants be given to war veterans as a bonus.

Of interest also was the New York speech by James F. Byrnes, director of War Mobilization, in which he opposed dismissal wages for war workers but advocated the federal government supplementing state unemployment benefits. War programs for 1944 and 1945 have been cut back by $16,750,000,000 already, he said, and a review just completed of the spare parts programs of the Army and Navy indicates there will be a reduction of $1,000,000,000 for the Army and $402,000,000 for the Navy in that category.

SCRAP dealers in several eastern cities appear to be worried about steel mills' lack of interest in purchasing turnings and low phos scrap. In many instances, it is said, mills have refused to pay the springboard premiums, brokers' fees, or other premiums, and a concerted move is reported under way in some places to break base prices on some grades.



Steel Ingot Production by Districts and Per Cent of Capacity

Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	Cleveland	Buffalo	Wheeling	South	Detroit	West	Ohio River	St. Louis	East	Aggregate
April 13	95.5	100.5	98.0	93.0	96.5	104.5	98.5	99.0	100.5	90.5	96.0	99.0	96.0	97.0
April 20	95.5	101.5	98.0	93.0	94.0	104.5	96.5	99.0	103.5	90.0	93.0	99.0	87.0	97.0

Industry to Make Own Decisions About Civilian Output, Under Canada's Proposals

Ottawa

• • • **In Canada** a more general swing from war to peacetime production activities is under consideration. It is announced here that officials of Wartime Prices and Trade Board have agreed upon a number of principles which will result in the smoothing of the conversion by Canadian manufacturers of civilian production. While these conversions have been worked out primarily with reference to the metal industries, other branches of civilian activities soon may be included. Although the new proposals are considered for the purpose of relaxing restrictive orders, it also is definitely pointed out that no "labor or material will be taken away from vital war industry as long as that requirement continues to exist." It also is stated that many of the points enumerated in the new schedule are subject to immediate change if war needs require such change. The main object behind the new ruling is that current restrictive orders "shall not constitute an obstacle to the resumption or expansion of civilian production when opportunities arise."

The main principles which have been agreed upon follow:

1. Where manufacturing restrictions can be relaxed or rescinded, Board policy will be, in future, to let industry make its own decisions about civilian production.

This means that only in very special cases will the Board in future attempt to direct or formally "program" the production of articles in the metals field. Experience gained in a few "programs" such as farm implements and washing machines, indicates no further need to formalize production of civilian-type goods.

2. Where it is not desirable to remove manufacturing restrictions in their entirety, existing prohibitions or production limitations may be replaced by an order permitting all manufacturers in the field to produce a stated percentage of their production in the base period.

This principle already has been applied in the case of electric stoves. It may be extended to other larger domestic appliances and goods, where production requires a considerable labor force, substantial plant facilities and a variety of materials and components. It is thought to have distinct advantage over the permit system in that all manufacturers in the field get an equal opportunity.

WPTB is prepared to transfer quotas where manufacturers are not prepared immediately to take advantage of their allotment, provided there is an agreement with individual administrators and with the War Industries Control Board.

3. Since the WPTB is anxious to avoid the use of the permit system wherever possible, a survey of each administration is being undertaken to bring individual policy into line with the general policy.

It is expected that permits will still be necessary in the case of custom-built machinery and apparatus (distinct from consumer durable goods distributed through the wholesale and retail trade) but wherever possible the use of permits to relax existing curtailment orders is to be eliminated.

4. Board officials are being advised against attempting to judge between the relative urgency of consumer needs, as, for example, electric toasters, or irons or washing machines. Decisions may, however, be necessary to insure that public needs are given consideration.

The broad principle laid down is the use of common sense and giving precedence to general utility or household requirements as against relaxation of controls over obvious luxuries or less essential gadgets.

5. All standardization and simplification orders in the metals, leather and textile fields are now being reviewed to determine whether, in light of easing supply situations, these orders are still necessary.

6. Special steps are to be taken to insure that where new civilian production is undertaken, "a reasonable quantity of low-priced lines reach the market."

Thus before production of civilian-type goods is authorized, a special clause will be inserted to require manufacturers to report full details of previous production as well as quantities, price ranges and other relevant details of proposed production.

7. No advance information of an intended relaxation will be given to manufacturers nor will the relaxation be made effective at some future date. All notices will be made by public announcement as soon as possible after decision to relax has been taken.

Board officials recognize that there will be problems regarding inventories but believe that these problems can best be handled by industry itself. The board apparently wishes to avoid imposing on industry "its own judgment as to what manufacturers should do with such inventories."

COATING STRIP STEEL: *General view (above) of the electro-galvanizing department of the new wire mill at South Works, Worcester, Mass., of American Steel & Wire Co., where four different widths of strip are being zinc coated simultaneously. The material is annealed, cleaned and coated in one continuous operation.*

One important principle in this connection is for the Board to insure "that restrictions are removed while there is still an excess of demand over supply, so as to minimize the inventory problem."

8. There is to be no postponement of relaxing orders so as to provide equality of opportunity for manufacturers.

Since the primary responsibility of the Board is to make goods available to consumers, it is thought undesirable that considerations having to do with the relative position of two or more companies within an industry should be the determining factor behind any decision. There was undoubtedly lack of uniformity in the commencement of war orders and the board takes the view that the change-over to civilian-type goods as and when it is made possible by supplies of materials, labor, plant etc., should not be hampered by attempts to give each manufacturer an "equal" start. Board policy, in short, will be to leave this problem "to the free working of normal competition."

9. There will be no disposition on the part of WPTB officials to retain import restrictions on civilian-type goods merely for the purpose of preventing foreign manufacturers from gaining an advantage over domestic producers.

The Board is also of the view that there is to be no relaxing of price ceiling restrictions, merely for the purpose of making more imports available. Even though the mainte-

nance of ceiling prices may operate indirectly to exclude certain imports from the Canadian market, imports, in the Board's view, must continue to be governed by the same price regulations as domestically-produced goods.

10. Newcomers in the manufacturing field who wish to produce civilian-type goods, have, in the past, been automatically excluded wherever there is short supply and the necessity for allocation. The general principle is to allocate available supplies on the basis of the use made of such supplies by various users in a given base period. This has tended to exclude new entrants.

The Board now recognizes that this general policy may have to be modified in the case where a plant has been established during wartime to produce a commodity for direct war use and can now devote some of its output to the civilian market.

The approach here is that the Board's fundamental interest lies in increasing supply.

In the case of a war plant wishing to convert its production to some civilian type of goods, considerations such as employment, utilization of war plants and other matters of government policy beyond the Board's purview would be raised.

11. Whenever a true surplus position exists in regard to any metal, it is the Board's intention in future to issue an amendment to the general order (A-579)—an amendment which will authorize the use of that metal.

Early U.S. Legislative Action Seen On Redistribution and Termination

By DONALD C. MacDONALD
Cleveland Regional Editor

o o o

• • • **The muddle** of mid-war contract termination and redistribution of surplus property and materials appears to be clearing and advanced observers are begininng to forsee legislative clarification of both problems within the next 30 to 60 days. It is highly unlikely that any method of procedure could be established in this period.

One of the main hurdles has been the tendency of Washington toward attempting to combine the two massive subjects into a single bill for legislation. After months of struggling and the presentation of at least 28 separate bills the answer seems to have been reached in the action of the Senate Committee for Postwar Economic Planning in recommending that the Military Affairs Committee sidetrack S.1730 in the interest of speed and pass on the amended S.1718. The proposed bill S.1730 is the George-Murray bill which combined legislation on both contract termination and surplus redistribution. Bill S.1718, on the other hand, is the Murray contract termination bill which concentrated upon termination alone. Thus, a hopeful attitude is bred within industry by this move which indicates that the problems will be legislated and enforced separately.

At least two other hopeful signs for an early attainment of basic policy legislation are seen in the fact that an overall plan for surplus redistribution has been created and appears broadly accepted by industry.

These urgency items were tax legislation and more recently contract termination, which appears to be on its way to prompt disposal if S.1718 can be pushed through to passage.

The fact that industry has a surplus distribution pattern already cut and awaiting legislative action is seen in the broad acceptance already accorded the plans presented by both the U. S. Chamber of Commerce and the National Association of Manufacturers. Both plans, while worded slightly differently, are generally appraised as similar in result. Key members of American industry have had these plans in their hands for over three months without finding cause for complaint or serious criticism. Consequently, it is to be assumed from this that the plans are basically what industry wants.

The basis of both the NAM and C. of C. plans is the same in that the solution of surplus disposal is left to industry . . . not government. In general, both plans advocate an overall redistribution commission.

The commission itself would be made up entirely of industry members possibly appointed by the President and certainly approved by the Senate.

A promient industrialist here said, "I am heartily in favor of this type of plan because it is absolutely necessary that government get out of business as fast as possible, both as to owning plants, as well as equipment and material. The fact that neither the U. S. Chamber of Commerce nor the NAM have received any criticism of their nearly identical plans indicates to me that this form of surplus property planning is what industry wants."

UNDERGROUND WORKERS: *Housed in 20 underground tunnels in western England, several hundred women are turning out war materials in complete safety from air attack. The tunnels were discovered by the firm Wilkie Engineers Ltd., when the foundations for a seaside resort were being laid. When the company began making war materials, the tunnels were converted into factory rooms.*

Easing of Restrictive Order upon Civilian Goods Indicated by Nelson

By DONALD BROWNE
Washington Staff

o o o

• • • **WPB Chairman** Donald M. Nelson on April 14 formally announced the appointment of the new reconversion policy committee, and said that the restrictive order confining new or increased civilian production to Group III and Group IV labor areas would be modified.

Mr. Nelson made it clear that one result of the promised changing of the restrictive order issued during his recent 10-day absence from the city is that WPB will now attempt to get the 2,000,000 electric irons programmed for release early this year instead of the estimated 200,000 which WPB said the program would be reduced to under the order.

The new committee which NAM President Robert M. Gaylord declined to become a member of on the grounds that such committees "defeat their own purpose" will be given the reconversion plans of regular WPB Industry Advisory Committees to pass upon in the public interest. The first plan came out of a meeting of the Automobile Industry Advisory Committee which met on Monday.

Mr. Nelson emphasized the "goldfish" bowl character of all future WPB reconversion moves. The public will be informed, he said, at the same time plans are transmitted to the reconversion policy group.

Congressional observers saw in the two moves a determination on the part of Mr. Nelson to prevent the Armed Services from hampering civilian production which will not interfere with war production and to start civilian production no matter how much a start affects the prewar competitive status between manufacturers.

It is believed that the WMC, and the War Department, sponsored the Staff Memorandum issued by Director of Industry Operations L. R. Boulware while Mr. Nelson was away. The statement that electric iron production would be reduced was issued also during Mr. Nelson's absence, and while Executive Vice-Chairman Charles Wilson was in charge of WPB.

The WMC and War Department desire to retain the ban on all increased and new production of civilian goods in Group I and Group II labor areas was said by WPB officials to be motivated by a wish to ease the manpower situation and prevent civilian production from starting and a rise of "complacency" at the same time. However, it was stated that there are small labor surpluses even in tight labor areas which could make the electric irons and other necessary civilian items. The electric irons would only require about 500 women to produce.

It is understood that there is a very definite split between Mr. Nelson and Mr. Wilson over these policies and while a truce is being maintained for the present at least, it is predicted that the whole question must be decided soon and the White House may have to decide it.

Meanwhile, talk of a reorganization of WPB as an immediate thing was denied, by a WPB spokesman on Saturday. The agency expires in December and legislation is being drafted which will increase WPB's powers in the whole reconversion picture.

The organization of the reconversion committee by Mr. Nelson was looked upon as an attempt to get reconversion planning started by letting the public in on the preliminary moves.

Membership of the new committee is as follows:

Eugene Meyer, publisher of the *Washington Post;* Gordon Rentschler, Chairman of the Board of the National City Bank of New York; Eric Johnston, president of the United States Chamber of Commerce; Philip Murray, president of the CIO; William J. Kelly, president of the Machinery and Allied Products Institute and of the Kelly O'Leary Steel Works, Chicago; William Green, president of AFL, and Ruth O'Brien of the Bureau of Human Nutrition and Home Economics, Agriculture Department.

Partial Payments by Army Permitted

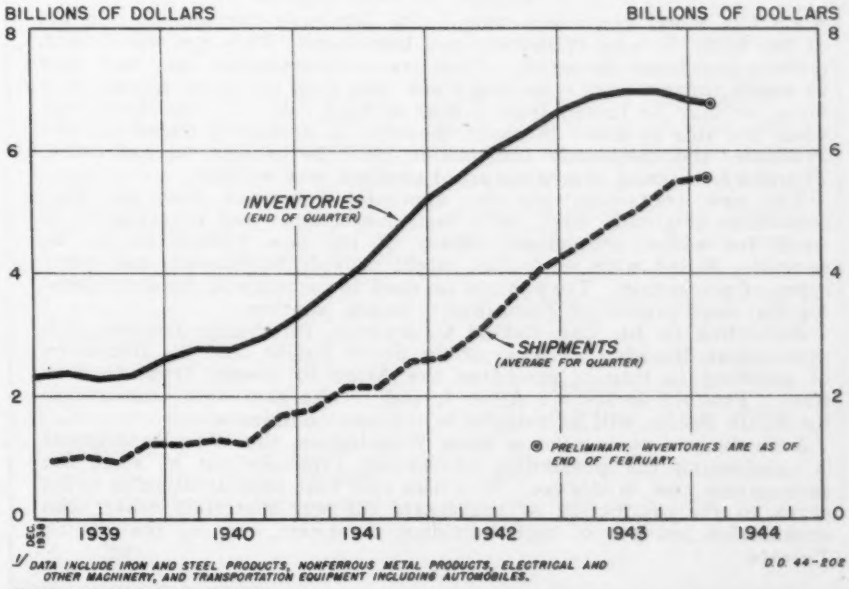
Washington

• • • **The War Department** recently set more liberal standards governing the authority of contracting officers to make partial payments to contractors when contracts are cancelled and at the same time tightened up on property disposition rules and regulations governing protection of the assignees and the government.

The new standards permit the making of partial payments whenever the "contractor represents that at least the amount of the proposed partial payment is due and the contracting officer is satisfied that such amount is clearly within the amount due."

Previously, a contracting officer

INVENTORIES AND SHIPMENTS OF METAL-FABRICATING INDUSTRIES 1/



1/ DATA INCLUDE IRON AND STEEL PRODUCTS, NONFERROUS METAL PRODUCTS, ELECTRICAL AND OTHER MACHINERY, AND TRANSPORTATION EQUIPMENT INCLUDING AUTOMOBILES.

D.D. 44-202

SOURCE: U. S. DEPARTMENT OF COMMERCE.

could make partial payments only when he and the contractor agreed that at least the amount of the proposed payment is "clearly due" in connection with the termination.

PR-15, the War Department regulation which governs contract cancellation, has always permitted contractors to retain property under terminated contracts without reimbursement for the property, provided the contracting officer agreed. Now, however, where an advance or partial payment, or a guaranteed loan to the contractor is made, the contracting officer will not give blanket authority to retain property without coordination in advance with the officers or branch charged with financial duties.

Where such blanket authority previously has been granted, the new regulation requires that the authority to retain property should be limited appropriately or conditioned, if the interest of the government so requires, before an advance or partial payment is made.

Similarly, in the event of an assignment of amounts due under the contract PR-15 has required the contracting officer to protect the rights of the assignee. Now, if advance or partial payments, or a guaranteed loan have been made, contracting officers are required to protect the interest of the government by preserving adequate security or obtaining payment where the property is to be retained by the contractor.

Steel Wage Panel Grants Delay Of One Week in Hearings of Producers

Washington

• • • **The War Labor** Board tripartite panel presiding over the steel wage case has postponed until April 25, the hearing of the steel manufacturers testimony that was scheduled to begin April 18. The panel said that the postponement was requested by the Steel Case Research Committee, representing many of the 94 companies involved.

Chairman David Cole of the panel said that the week's postponement was granted on the assurance of the steel companies that they would be able to complete presentation of their case in a shorter period if they had additional time in which to prepare the case. Philip Murray, president of the CIO-USWA, objected to the delay.

The steel companies notified the panel that they were consolidating the presentation of the case and that through the granting of the additional week they hope to include more of the 94 companies in the consolidated presentation.

The steel panel conferred on April 14 in New York with representatives of the union and representatives of the approximately 350 other companies involved in the general steel case regarding procedure for handling the cases of the companies outside of basic steel. It is said that pending the hearing of the basic steel case next week, consideration will be given to whether another panel or more panels should be set up, or whether a single panel will hear the case as it affects all of the companies.

•

Stabilization Discussed By Steel Case Committee

New York

• • • **"Steel Wages, A National Issue,"** is the name of a publication prepared and distributed by the Steel Case Research Committee of the Steel industry, pointing out how the Little Steel formula came into being and containing quotations from Presidential executive orders and from speeches and statements by high government officials on the necessity for maintaining the "Hold-The-Line" order issued on April 8, 1943.

In separate steps, it takes up steel wages before the Little Steel formula; the creation of the formula; the formula exceeded; the Stabilization Act; the "Hold-The-Line" order; the union reversal of position on wage increases; attacks on stabilization; and steel case preliminaries.

Pointed out is the fact that average hourly earnings of steel workers rose from about 84c. prior to the invasion of France to $1.15 in January, 1944. From the time of the creation of the Little Steel formula in July, 1942, wages increased by December, 1942, from 99.2c. per hr. to 108.3c. per hr. The higher hourly earnings at present and the increase over levels that prevailed after the Little Steel formula became operative reflects directly the greater amount of overtime at premium pay.

Preliminary to the summarization of the events leading up to the present steel wage case, the committee pointed out that nominally the issue concerns only steel companies and the CIO-USWA, but actually the principals in the case are the union and the United States government. The outcome of the case will affect the future economic life of the country, since the stabilization efforts of the government are the chief stakes in the fight.

A Few Facts About New Ammunition Containers

• • • **The metal containers now being produced for ammunition are of two basic designs, cylindrical and box shape. They are water-tight, termite-proof and fireproof. They are so constructed that they may be safely thrown from a moving truck, may land on rough terrain with force, or may be tossed from a boat at high tide and recovered later when the tide is out. In many theaters of operation docks are not available, and frequently ammunition must be brought in under fire. Therefore the need of a waterproof package was evident.**

The new containers are not appreciably heavier than the fiber containers originally used, with their metal ends and repackaging in wood for added protection. Many of the new containers can be re-used. Filled with sand they might provide barricades, and other types of protection. They might be used for storage of food or clothing that need protection from insects or the weather.

According to Lt. Col. Robert C. Downie, Pittsburgh District ordnance chief, the high humidity of the South Pacific, and the frequency of handling in transit, prompted the Army to change from fiber to steel. Production started April 1, and it was said only ammunition for South Pacific will be shipped in the new containers.

According to some reports from Washington, the War Department is considering the possibility of making canisters out of steel for ammunition now in storage. It is also said that consideration is being given to the production of containers for war materials other than ammunition because of high humidity, dampness, etc., in the Pacific Theatre.

Auto Industry Asked to Return to WPB with Plans and Much Other Data

Washington

• • • **The meeting of** top executives of the nine automobile manufacturing companies on April 17 with WPB Chairman Donald M. Nelson and Executive Vice-Chairman Charles E. Wilson to discuss plans for reconversion of the industry was shadowed by a need for legislative power by WPB to deal with surplus property, manpower and contract cancellations.

The need for authority over these phases of industrial demobilization became apparent when automobile men were requested to return to WPB for a second meeting within 60 to 90 days with plans for restricted production of 2,000,000 cars and subsequently for unlimited production, showing need for machinery, plant space and manpower, the number of government-owned tools which must be disposed of by each manufacturer, and those which each company wishes to retain. Auto leaders were also asked to furnish information on what contracts should be shifted out of the Detroit and other car-making areas.

Nelson arranged to go before the Senate Postwar Committee April 19 to discuss new legislation for WPB since its authority expires in December of this year. It is assumed that these all important questions involved in reconversion will come up for discussion and it is apparent that the new legislation must correct organizational flaws before WPB can do very much about reconversion.

Company representatives and WPB agreed that no resumption of new passenger car production should be started until the end of the Japanese or the European wars and Charles E. Wilson, president of General Motors, spoke for the industry when he said that it would not be possible to keep production costs down unless the industry were authorized to produce at least 2,000,000 cars.

"Not a single one of us knows when a return to the production of automobiles will be possible," Mr. Nelson said. "It depends entirely on military events. However, it is time for the industy and the government to sit down together to discuss the major problems that will be involved in return to passenger car production when the day for such a return arrives."

"We're not taking our eye off the ball," WPB Vice-Chairman Wilson said. "For many months to come, you in the industry will continue to have a tremendous war production job. We must be ready to meet the varying circumstances that may arise eventually."

Not all of the meeting was spent in agreement. Mr. Wilson of GM and Paul G. Hoffman, president of Studebaker Corp., got into a heated discussion when the question of manufacturing quotas to be assigned when production is started. Mr. Hoffman was joined by George W. Mason of the Nash-Kelvinator Corp., and Powel Crosley, president of the Crosley Corp., who both declared that they could not survive the reconversion period if their companies were restricted to a percentage of their prewar output. The question was put over until a future meeting by common consent. Both Nash and Packard have little or no available idle capacity now and manpower in their respective areas is very tight, it was said. Nash expects to get increased war work with the award of contracts for the new C-type Pratt and Whitney engine, which involves new tooling to produce an engine which is said to develop about 2600 hp.

It was generally agreed that any serious transportation crisis due to a lack of passenger cars within the next two years could be avoided if WPB provides enough repair parts and tires. John Middlekamp, WPB Automobile Division director, said that every effort was being made by WPB now to increase repair part production.

Lucius Tompkins, assistant WPB Rubber director, told THE IRON AGE that the planned production of 22,000,000 automobile tires a year for the next two years should be adequate to take care of the estimated 21,000,000 automobiles on the roads on the basis of a need of one tire per car per year.

Some manufacturers feared a serious unemployment situation in the industry before 1944 is out. Mr. Wilson of General Motors said that workers could not get along on the wages of a 40-hour week with increased taxes and higher living costs.

James H. Marks, vice president of Packard, said that he felt that increasing cutbacks would cause the development of a manpower surplus "much sooner than most people think." Mr. Marks pointed out that the desire of workers to be retained in their jobs while the industry was being cutback would increase productive efficiency and contribute to layoffs.

Manufacturers expressed indignation over the government lack of a policy for getting government-owned machinery and materials out of the company plants. They said that one of the first policies that should be laid down should be a policy governing tools and machinery, including both the question of releasing government-owned equipment and the question of placing orders now for new tools and with the machine tool industry.

Shift to Brass Closes Steel Cup Plant

• • • The announcement that the Army is shifting back to brass from steel for cartridge cases was followed last week by word that the Englewood (Chicago) plant equipped by American Can Co. for cartridge case cup manufacture is being dismantled and the equipment stored by the Army.

The Army's new move generally is attributed to improved raw material stocks. Victorious over the Nazi submarine menace, military officials were able six months ago to start cutting back the arms supply program, thereby releasing large amounts of brass.

Nevertheless, the development of steel cases was a decided success, according to Ordnance officers. Maj. Gen. L. H. Campbell head of Army Ordnance, last week paid tribute to "the interest, cooperation and determination of the techicians and production men of American industry which proved the venture a success."

Brig. Gen. James Kirk, chief of the Ordnance small arms branch, declared "We know now that if at any time we are not able to get sufficient brass we can make satisfactory ammunition of steel."

Financial Analysis of t

By THOMAS E. L

	GROUP I		Ingot Capacity, Net Tons	Ingot Production, Net Tons	Rate of Operations, Per Cent	Net Sales and Operating Revenue, (000 omitted) Dollars	Net Income (000 omitted) Dollars	Profit Margin on Sales, Per Cent	Earnings Per Ton of Ingot Capacity, Dollars	Earnings Per Ton of Ingot Produced Dollars	Preferred Stock Outstanding, No. Shares	Preferred Stock Outstanding, (000 omitted) Dollars	Common Stock outstanding, No.
1	U. S. Steel Corp.	1943	31,150,900	30,540,000	98.0	1,976,345	63,449	3.21	2.04	2.08	3,602,811	360,281	8,7
		1942	30,549,000	30,029,950	98.3	1,862,952*	71,249*	3.82	2.33	2.37	3,602,811	360,281	8,7
2	Bethlehem Steel Corp.	1943	12,900,000	13,015,750	100.9	1,902,820	32,125	1.69	2.49	2.47	933,887	93,389	2,9
		1942	12,700,000	12,451,700	98.0	1,495,672*	25,388	1.70	2.00	2.04	933,887	93,389	2,9
3	Republic Steel Corp.	1943	8,616,800	8,651,275	100.4	549,061	12,011	3.31	1.39	1.39	329,210	32,921	5,6
		1942	8,631,700	8,597,200	99.6	517,892	17,155	3.29	1.99	2.00	333,258	33,326	5,6
4	Jones & Laughlin Steel Corp.	1943	5,024,400	5,125,800	102.0	280,676	9,512	3.39	1.89	1.86	586,822	58,682	1,0
		1942	4,416,000†	4,548,800†	103.0	234,982	10,142	4.32	2.30	2.23	586,829	58,683	1,0
5	National Steel Corp.	1943	3,900,000			256,168	11,698	4.57	3.00		none	none	2,2
		1942	4,100,000			219,851	11,930	5.43	2.91		none	none	2,2
6	Youngstown Sheet & Tube Co.	1943	4,002,000	4,112,500	102.8	224,879	8,037	3.57	2.01	2.66	150,000	15,000	1,0
		1942	3,870,000	3,970,990	102.6	217,856	10,306	4.73	1.95	2.60	150,000	15,000	1,0
7	Inland Steel Co.	1943	3,350,000	3,571,000	106.6	204,307	10,802	5.29	3.22	3.03	none	none	1,0
		1942	3,350,000	3,427,000	102.3	190,285	10,721	5.63	3.20	3.13	none	none	1,0
8	American Rolling Mill Co.	1943	3,218,000	3,155,400	96.8	199,266	6,098	3.11	1.89	1.96	449,930	44,993	2,0
		1942	3,134,000	2,848,740	90.9	180,979	7,781	4.30	2.48	2.73	449,930	44,993	2,0
9	Wheeling Steel Co.	1943	1,960,000	1,947,000	99.3	121,360	4,339	3.58	2.21	2.23	363,166	36,317	5
		1942	1,960,000	1,915,600	97.7	118,989	4,442	3.73	2.27	2.32	363,166	36,317	5
10	Colorado Fuel & Iron Co.	1943	1,131,250	1,142,570	101.0	50,273	1,352	2.69	1.19	1.18	none	none	5
		1942	1,142,575	1,115,150	97.6	52,131	2,580	4.95	2.26	2.31	none	none	5
11	Pittsburgh Steel Co.	1943	1,072,000	1,011,925	94.4	66,625	1,636	2.46	1.53	1.62	162,270	16,227	5
		1942	1,072,000	986,375	92.0	70,996	2,488	3.50	2.32	2.52	162,825	16,283	5
12	Lukens Steel Co.[2]	1943	714,340	639,300	89.5	52,338	1,317	2.52	1.84	2.06	none	none	3
		1942	714,340	722,200	101.1	43,990	1,173	2.67	1.64	1.62	none	none	3
13	Sharon Steel Co.	1943	636,000	646,175	101.6	39,916	1,008	2.57	1.58	1.56	59,720	5,972	3
		1942	596,000	640,700	107.5	35,355*	1,302*	3.68	2.19	2.03	59,720	5,972	3
14	Alan Wood Steel Co.	1943	550,000	545,600	99.2	30,138	699	2.32	1.27	1.28	71,861	7,186	3
		1942	739,200	739,200	100.0	30,263	740	2.44	1.00	1.00	71,861	7,186	3
15	Granite City Steel Co.	1943	403,200			17,225	554	3.22	1.37		none	none	3
		1942	403,200			17,738	616	3.74	1.53		none	none	3
16	Continental Steel Co.	1943	364,000	361,000	99.2	22,264	763	3.43	2.10	2.11	9,878	988	2
		1942	364,000	347,600	95.5	22,866	939	4.11	2.58	2.70	17,667	1,767	2
17	Laclede Steel Co.	1943	349,300	297,050	91.1	13,139	46	0.35	0.13	0.15	none	none	2
		1942	308,850	286,800	82.1	13,184	152	1.15	0.49	0.53	none	none	2
18	Keystone Steel & Wire Co.[1]	1943	302,400			15,389	1,092	7.10	3.61		none	none	7
		1942	302,400			17,429	1,796	10.30	5.94		none	none	7
	Total, Group I	1943	79,644,460	74,732,315		6,022,689	166,538	2.77	2.09	2.24			
		1942	78,353,265	72,628,005		5,343,410	180,900	3.39	2.31	2.50			
	GROUP II												
19	Crucible Steel Co. of America	1943	1,386,770			209,436	4,950	2.36	3.57		322,920	32,292	4
		1942	1,338,090			183,005*	4,865	2.66	3.64		327,026	32,703	4
20	Midvale Co.	1943	484,120			16,338	2,047	12.53	4.23		none	none	6
		1942	409,250			9,468*	2,583	27.28	6.31		none	none	6
21	Allegheny-Ludlum Steel Corp.	1943	452,860	425,690	94.0	115,141	3,865	3.36	8.54	9.08	28,388	2,839	1,2
		1942	550,560	526,330	95.6	102,820*	4,129	4.02	7.50	7.86	28,388	2,839	1,2
22	Rustless Iron & Steel Corp.	1943	114,000			32,997	2,236	6.78	19.62		36,512	1,826	9
		1942	114,000			32,117	2,645	8.23	23.29		36,512	1,826	9
23	Vanadium-Alloys Steel Co.[1]	1943	11,910			12,573	1,050	8.35	88.18		none	none	2
		1942	13,950			11,883	1,248	10.50	89.46		none	none	2
	Total, Group II	1943	2,449,660			386,485	14,148	3.66	5.78				
		1942	2,425,850			339,293	15,470	4.60	6.38				
	Total, Groups I & II	1943	82,094,120			6,409,174	180,686	2.82	2.20				
		1942	80,779,115			5,682,703	196,370	3.46	2.43				

* Adjusted after renegotiation.
† Includes Otis Steel Co. production and capacity for six months of 1942 and all of 1943.
‡ $224,780 transferred to capital stock and $200,992 deducted for investment in subsidiary company.
§ Deducted $1,000,000 for contingency reserve.
■ $300,000 deducted from Earned Surplus for Contingency reserve.
[1] Fiscal year ends June 30.
[2] Fiscal year ends Oct. 30.

. . . Highlights of the Steel

• Companies whose steel-producing capacity totaled 82,094,120 net tons of steel ingots in 1943 earned $2.20 per ton of ingot capacity. Of the companies reporting whose bulk production consisted of carbon steel and carbon steel products, earnings were at the rate of $2.24 per ton of steel produced, down from $2.50 in 1942.

• Net income for the carbon steel producers equalled about $166,538,000 in 1943, down 7.99 per cent from $180,900,000 earned in 1942, while sales jumped from $5,343,410,000 in 1942 to $6,022,689,000 in 1943. Producers whose output is mainly alloy steels earned $14,148,000 in 1943 as against $15,370,000 in 1942, while sales jumped from $339,293,000 in 1942 to $386,485,000 in 1943. Total earnings for both groups in 1943 were $180,686,000 as against $196,370,000 in 1942, whereas sales were up from $5,682,703,000 in 1942 to $6,409,-174,000 in 1943.

• Consolidated surplus of all companies listed was increased $51,331,000 from $1,063,180,000 in 1942 to $1,114,511,000 in 1943, while the long term debts of the reporting companies dropped from $696,106,000 in 1942 to $640,918,000 in 1943, a total of $55,188,000. The equity of the stockholders in the companies reporting increased from $3,306,184,000 in 1942 to $3,356,699,000 in 1943.

• Considerable divergence is noted between the two

Steel Industry, 1943-1942

...sociate Editor, The Iron Age

Common Stock Outstanding, (000 omitted) Dollars	Income Transferred to Surplus After Dividends, (000 omitted) Dollars	Consolidated Surplus, (000 omitted) Dollars	Stockholders Equity, (000 omitted) Dollars	Total Assets, (000 omitted) Dollars	Long Term Debts, (000 omitted) Dollars	Return on Proprietary Investment, Per Cent	Current Assets to Current Liabilities, Ratio to 1	Preferred Dividends Paid, (000 omitted) Dollars	Common Dividends Paid, (000 omitted) Dollars	Earnings Per Common Share, Dollars		GROUP I	
652,633	3,416	416,146	1,428,060	2,106,062	128,994	4.44	2.49	25,220	34,813	4.39	1943	U. S. Steel Corp.	1
652,633	11,216*	411,730*	1,424,644*	2,123,324	139,695	5.00	2.34	25,220	34,813	5.29	1942		
283,574	7,692	121,344	498,308	1,044,870	156,503	6.45	1.65	6,523	17,910	8.58	1943	Bethlehem Steel Corp.	2
283,574	941	107,843	484,806	1,005,647*	162,171	5.24	1.63*	6,537	17,910	6.31	1942		
132,520	4,356	103,720	269,161	394,628	72,232	4.46	3.93	1,985	5,670	1.77	1943	Republic Steel Corp.	3
132,520	6,050	99,365	265,211	411,264	78,806	6.47	3.66	2,018	7,087	2.67	1942		
67,374	3,380	72,337	198,392	300,102	43,879	4.79	2.86	2,930	3,202	4.11	1943	Jones & Laughlin Steel Corp.	4
67,373	3,913	68,952	195,007	299,496	47,923	5.20	2.66	2,775	3,454	4.60	1942		
55,157	5,090	105,914	161,071	258,132	56,274	7.26	2.90	none	6,609	5.30	1943	National Steel Corp.	5
55,002	5,331	100,788	155,790	255,069	57,806	7.66	2.41	none	6,599	5.41	1942		
105,088	3,862	46,306	166,394	253,607	60,176	4.83	7.01	825	3,350	4.31	1943	Youngstown Sheet & Tube Co.	6
105,088	5,293	41,794	161,882	260,249	68,636	6.37	5.73	825	4,188	5.66	1942		
54,283	3,027‡	54,283	116,783	183,381	34,340	9.25	3.92	none	7,349	6.61	1943	Inland Steel Co.	7
51,166	2,372§	51,166	112,145	179,933	37,360	9.56	3.80	none	7,349	6.57	1942		
71,739	1,205	22,425	139,157	190,091	17,750	4.38	3.24	2,025	2,869	1.42	1943	American Rolling Mill Co.	8
71,739	2,888	21,221	137,953	200,155	24,828	5.64	3.70	2,025	2,869	2.01	1942		
29,188	1,669	24,970	89,886	132,723	32,400	4.83	6.83	1,816	854	4.32	1943	Wheeling Steel Co.	9
29,188	1,772	23,301	88,217	132,431	33,600	5.04	6.19	1,816	854	4.50	1942		
5,636	788	19,708	25,344	53,200	11,035	5.33	2.38	none	564	2.40	1943	Colorado Fuel & Iron Co.	10
5,636	1,294¶	18,871	24,507	52,221	11,035	10.53	1.90	none	986	4.58	1942		
4,862	1,386	20,234	41,379	57,419	7,083	3.95	3.21	251	none		1943	Pittsburgh Steel Co.	11
4,862		19,728	40,817	58,436	8,221	6.10	3.00		none		1942		
3,280	936	8,173	11,353	33,540	2,878	11.60	1.25	none	382	4.14[9]	1943	Lukens Steel Co.[2]	12
3,280	855	7,237	10,417	25,628	4,003	11.26	1.33	none	318	3.68[9]	1942		
3,975	317	8,340	18,287	22,968	none	5.51	3.50	299	392	2.15	1943	Sharon Steel Co.	13
3,975	611	8,023	17,970	22,433	900	7.24	3.60	299	392	3.05	1942		
4,389	196	4,329	15,900	19,117	none	4.40	3.57	503	none	0.98	1943	Alan Wood Steel Co.	14
4,389	237	4,132	15,703	19,363	none	4.71	2.89	503	none	1.18	1942		
8,484	353	4,721	13,205	17,800	2,150	4.20	0.69	none	201	1.45	1943	Granite City Steel Co.	15
8,484	482	4,368	12,852	17,411	2,671	4.80	0.86	none	134	1.61	1942		
5,279	292	6,306	12,570	16,141	1,000	6.59	4.95	69	401	3.46	1943	Continental Steel Co.	16
5,279	413	6,091	13,133	16,685	1,200	7.15	5.96	125	401	4.06	1942		
4,125	228[4]	2,065	6,190	7,930	none	0.74	5.21	none	268	0.22	1943	Laclede Steel Co.	17
4,125	209[3]	1,638	5,763	7,723	750	2.64	5.71	none	361	0.74	1942		
3,159	297	7,925	11,082	11,845	none	9.85	5.44	none	796	1.44	1943	Keystone Steel & Wire Co.[1]	18
3,159	849	7,392	10,549	12,145	none	17.03	2.89	none	947	2.37	1942		
	37,754	1,049,246	3,222,522		626,694	5.17					1943	Total, Group I	
	46,726	1,003,640	3,177,366		679,605	5.69					1942		
												GROUP II	
11,117	1,995	23,528	66,937	121,675	12,467	7.39	2.64[6]	1,625	1,330	7.48	1943	Crucible Steel Co. of America	19
11,117	2,321[5]	21,442	65,262	117,273	13,892	7.45	2.14[6]	1,635	886	7.26	1942		
10,575	848	6,745	17,320	36,956	none	11.82	1.90	none	1,199	3.41	1943	Midvale Co.	20
10,575	1,594	5,897	16,472	35,714	none	15.68	1.64	none	1,259	4.30	1942		
7,891	1,146	22,355	33,084	45,863	none	11.68	2.33	198	2,521	2.90	1943	Allegheny-Ludlum Steel Corp.	21
7,883	1,414	21,277	31,999	47,613	none	12.90	1.92*	198	2,517	3.12	1942		
927	1,450	7,218	9,970	20,047	1,757	22.43	1.78	92	695	2.32	1943	Rustless Iron & Steel Corp.	22
927	1,859	5,767	8,520	18,487	2,609	31.01	1.67	92	695	2.76	1942		
2,000	254	5,419	6,866	11,037	none	15.30	2.15	none	797	5.26[7]	1943	Vanadium-Alloys Steel Co.[1]	23
2,000	455	5,166	6,565	9,933	none	19.01	2.40	none	793	6.31[8]	1942		
	5,693	65,265	134,177		14,224	10.54					1943	Total, Group II	
	7,643	59,549	128,818		16,501	12.01					1942		
	43,447	1,114,511	3,356,699		640,918	5.38					1943	Total, Groups I & II	
	44,369	1,063,180	3,306,184		696,106	5.94					1942		

[1] Withdrawn from surplus to pay dividends.
[2] $850,000 added for depreciation reserve adjustment. Dividends greater than income by $340,102.
[3] Deduction of $22,234 for debenture discount and expense.
[6] Exclusive of cash on deposit representing advances on incompleted contracts.
[7] On 199,606 shares.
[8] On 197,767 shares.
[9] On 317,976 shares.

Industry Financial Survey . . .

groups in return on proprietary investment, with the second group (alloy producers) showing earnings at more than twice the rate of earnings on proprietary investment of carbon steel producers. This results in part from the highly specialized products of group II, commanding considerably higher prices per ton than those of group I producers. As the bulk of the tonnage is in group I, the rate of 5.17 per cent return on investment (proprietary) is more indicative.

• From the standpoint of current solvency, the ratio of current assets to current liabilities shows the industry in a comfortable position. A standard of 1.5 to 2:1 is accepted as good for this ratio, but the industry, generally, shows considerably better than this.

• The bulk of the drop in net income went into income and excess profits taxes, higher labor and material costs in the face of the stabilized prices, and higher transportation costs. Reserves for contingencies have been set up by most companies to take care of postwar conversion and to soften the impact of renegotiation. Adjustments were made because of renegotiation of the 1942 figures of some companies. The table shows the adjusted figures rather than those issued at the close of 1943, and calculations are based on the adjusted figures. The number of companies thus affected were comparatively few, as most companies reported that no refunds were necessary.

WRAP PARTS WELL: *Wrapping spare parts in wax paper at Joliet plant. Conveyor belt runs along the other side of the table.*

STAGES IN RUST PREVENTION: *The articles are shown first in the condition they are received. The second stage, indicated by the three rows vertically, shows the articles after they have been washed, dried and coated with the corrosion prevention fluid. The third stage shows them after they are wrapped, the fourth after they have been dipped in the sealing wax and the fifth, and last, after the powder has been sprinkled over the wrapped article.*

NOTHING RUSTY HERE: *This may look like a group of Hollywood starlets but it isn't. They are employees of the Central Spare Parts Warehouse at Joliet, Ill., where the corrosion prevention plant is located. Left to right, Aidcan Doyle, Margaret Kerin, Anne Heckenkamp, Dorothy Ann McCarthy, Barbara Hill and Adelaide Cooper.*

Navy's War Against Corrosion Detailed; Benefits Predicted

o o o

By L. W. MOFFETT
Washington Editor

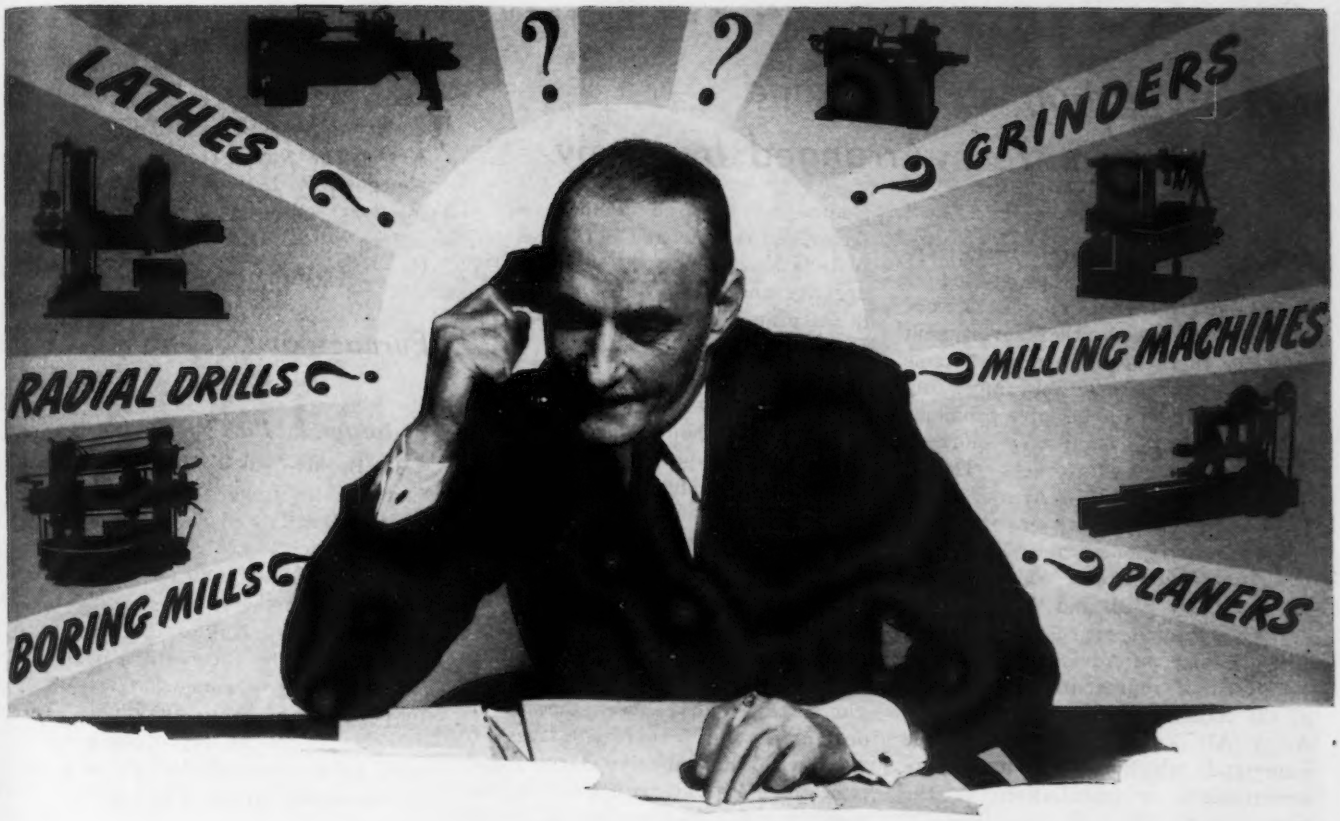
o o o

• • • **Relentless** as its drive against the Japs in the Pacific, the American Navy has opened its way to Tokyo by first attacking another deadly enemy, whose name is rust. In this global war, with numerous theaters of action and a wide variety of climates, the Navy has maintained its vast supply lines only because it has persistently waged what Rear Admiral William Brent Young, SC, USN, calls a "spare parts war." Admiral Young, Chief of the Bureau of Supplies and Accounts and Paymaster General, launched the corrosion prevention program, realizing that the success or failure of many battles depends upon whether the spare parts back of the front lines are available to repair and return vital weapons to the firing line. If the parts that have been rushed to the depots to the rear of the lines are only slightly corroded, or in any way unusable, the progress of the war may be impeded.

The present-day highly mechanized warfare and mass production of delicate machinery necessitates parts with close tolerances to provide full and complete protection from the time they leave the factory to their installation in weapons. The tiniest speck of corrosion may render a part useless. Time, energy, money and transportation are wasted. Most important of all an essential fighting implement has become as useless as though it had been destroyed. Conceivably, a rusty part for a plane or a tank can delay the launching of an entire attack.

The story of corrosion prevention, a bright spot of the battle the Navy has waged in the laboratory, began early in the war with a series of experiments. Private industry also was in the fight. Information has been freely interchanged. In time of war the value of preventing corrosion is the difference between victory and possible defeat. In time of peace the value in services, new uses of products and in dollars will be inestimable. Even in money in war time, Admiral Young has estimated that tangible annual savings are in excess of $10,000,000. Corrosion prevention work

(CONTINUED ON PAGE 160)



READY TO SERVE THE POSTWAR NEEDS OF AMERICAN INDUSTRY

When American manufacturers were suddenly confronted with the task of producing the munitions of war . . . the used machine tool dealers were organized to play their part in mobilizing the necessary machine tools.

Today America's used machine tool dealers are equally ready to aid in demobilizing war machine tools and distributing them back into postwar industry.

To this end, MDNA dealer members are planning to serve the machine tool users as follows:

1. They will make every effort to obtain complete details and proper listing of machine tools released by the Government when their need in the war effort has ended.

2. Through their technical knowledge and experience they can use this information to select and recommend the machine tool most suitable for the particular production problem.

3. There will be an interchange of information among the members of the Association so that machine tool buyers in any locality, who are serviced by MDNA dealers, can benefit from the combined information of the MDNA dealers.

The machine tool buyer should keep in close contact with MDNA dealers and acquaint them with his needs from time to time so that they may be better able to serve his postwar needs and production problems.

MDNA
MEMBER

The MDNA insignia is intended as a trademark of quality. Its appearance in the advertising of an MDNA dealer member testifies that he subscribes to and practices in his business relations the Code of Ethics adopted by Machinery Dealers' National Association.

MACHINERY DEALERS NATIONAL ASSOCIATION

20 NORTH WACKER DRIVE CHICAGO (6) ILLINOIS

Representation on WPB and WMC Committees Arranged by Army

Washington

• • • **An Army Service** Forces representative has been designated in each of the WPB's 13 regions to work in cooperation with other government agencies to raise production of items most vitally needed for impending offensives and to help solve problems arising from the manpower shortage and the drafting of workers. The 13 officers will arrange for Army Service Forces representation on all Area Production Urgency and Manpower Priorities Committees, which are being set up by WPB and WMC.

Each regional representative also will organize an Advisory Committee composed of representatives of each of the Army's technical services, the Army Air Forces, and the Service Commands which have an interest in procurement or installations in the region.

The primary function of the Army representative is to keep the Area Committees advised of the needs of Army contractors and Service Forces installations in matters of production urgency and manpower, and to assist in the preparation of Area Production Urgency lists.

Purpose of the Area Committees is to obtain a better distribution of manpower within their respective critical areas and to balance production with the available manpower. It is hoped that manpower shortages, which have held back production in many key factories, can be overcome through the cooperation of labor, management and government agencies and the mobilization of all community resources.

As part of their duties, the 13 regional officers have been directed to designate area representatives to work with the Selective Service System to help determine which war workers under 26 years of age should continue to be deferred as essential to the war effort.

Torpedo Output Rises 900% in 2 Years

Washington

• • • **Monthly** production of naval torpedoes now exceed the entire output of the first World War, while other materials manufactured under the supervision of the Bureau of Ordnance continue to show remarkable increases, the Navy Department reported last week.

Torpedoes of all types increased 250 per cent in 1943 over 1942 and 730 per cent over 1941, while production in December, 1943, was 900 per cent higher than in the corresponding month of 1941.

Fire control directors, another intricate item, showed a 3000 per cent increase in December, 1943, compared with December, 1941. Lead computing sights for directing fire of 20-mm. guns against dive-bombers and torpedo planes were not in production in December, 1941, but production in 1944 will exceed the 1942 output by 2700 per cent.

Production of guns and projectiles went up phenomenally in all fields. The "most spectacular" increase, the Navy said, was in anti-aircraft machine guns. In December, 1941, ten tons of this type of weapon were produced; last December the output was nearly 200 tons.

•

• • • **The** Naval Torpedo Station at Newport, R. I., has placed an order for 2,000 sub-assembly parts for torpedoes with the Package Machinery Co.

o o o

BELL HELICOPTER: *This is the helicopter that Bell Aircraft Co. announced had been "further perfected" in* 1943. *It incorporates a "principle giving stability in flight" the company reported.*

o o o

Furnace and Foundry Beehive Coke Easier

Uniontown, Pa.

• • • **Beehive** coke supplies, both for furnace and foundry use, have been easier recently. A large number of ovens which have been supported through demand from domestic home users will be taken off soon.

Sources here believe that by mid-year the number of beehive ovens in operation will be somewhat less than 75 per cent of those available. The increase in the supply of by-product coke, due to new installations, is mostly responsible for the slump in beehive demand.

Most of the demand for beehive coke is for machine drawn, as consumers will not pay the premium for the hand drawn product. Owners of hand drawn beehive coke plants, in many cases, are finding costs too high to operate, even with the above ceiling premium.

The draft situation, which affected the beehive plants sometime ago, will not be much of a factor now, as most of the younger men either have been drafted or have gone elsewhere for work.

23 Monthly Records Fall At C-I Plants During March

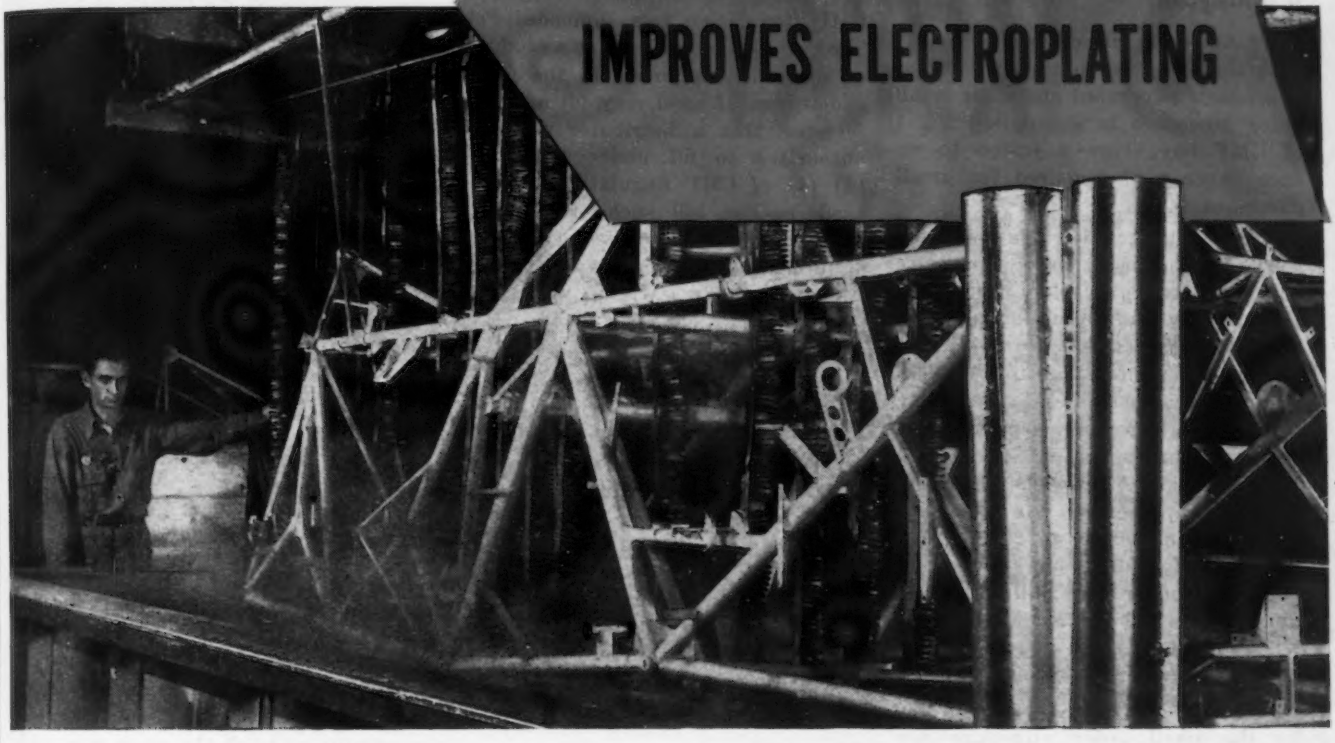
• • • **Twenty-three** new monthly unit production records were made by Carnegie-Illinois Steel Corp. during March. Included in this number was a new high for a previous record of 27 years' standing.

More than 215,000 tons of iron were produced at the Edgar Thomson Works last month. The Clairton Works established a new blast furnace mark. The Homestead Works produced a total of more than 348,000 tons of open hearth steel during that month, while the Ohio Works at Youngstown as well as the rolling mill departments of the company also shared in the record breaking, by establishing new records.

Prosolv *B*

offers outstanding advantages

NEW TURCO CLEANER IMPROVES ELECTROPLATING



Equally effective in still tank and electro-cleaning

So positive are the advantages of Turco Prosolv *B* that prominent electroplaters have switched to this new cleaner immediately following tests *although they had considered satisfactory the materials they had been using.*

Turco Prosolv *B* insures the chemical and physical cleanliness that is essential to 100% bonding to steel of zinc, cadmium, chromium and other plate. It removes every trace of oil, grease, smut, paint and rust preventive compound. It contains no soap; leaves no deposit. Rinsing is complete, even though parts may have dried.

A highly concentrated product, Turco Prosolv *B* is 100% active. Every particle works; there is no waste.

As this new cleaner is effective in both still tank and electro cleaning, it simplifies stocking and plant procedure where both processes are employed.

Try Turco Prosolv *B* for stripping tin deposits formed during certain electro-pickling processes. A standard cleaning tank may be used for this.

Call the Turco Field Service Man for details on this specially formulated electro and still tank cleaning material which is doing such a notable job the nation over. Write today.

Follow Prosolv *B* with Turco Descaler This second step in preparing steel for plating is as necessary to a perfect job as the primary cleaning operation in Prosolv *B*. Any rust, mill, welding or heat-treat scale will prevent bonding of plate. Turco Descaler removes these without attacking the base metal. Thus the combination of Turco Prosolv *B* and Descaler insures quality plating at low cost. Let us furnish full details.

Rust Bar treatment for unplated portions. Partially plated parts, if treated with Turco Rust Bar, are well protected from corrosion during indoor storage although subjected to severe conditions. A thin film of Rust Bar is resistant not only to airborne water vapor, but also to corrosive gases and other types of corrosive agents.

TURCO

Turco

PRODUCTS, INC.

Write Dept. IA-4

SPECIALIZED INDUSTRIAL CHEMICAL COMPOUNDS

MAIN OFFICE AND FACTORY: 6135 SOUTH CENTRAL AVE., LOS ANGELES 1 • SOUTHERN FACTORY: 1606 HENDERSON STREET, HOUSTON 10, TEXAS • CHICAGO OFFICE AND FACTORY: 125 WEST 46TH STREET, CHICAGO, ILL. • SERVICE MEN AND WAREHOUSE STOCKS IN ALL PRINCIPAL CITIES

Limits Under CMP Small Order Procedure for Class A Products Increased

Washington

• • • **Amounts** of controlled materials that may be contained in Class A products purchased under the small order procedure in Regulation No. 1 of CMP have been adjusted to reduce paper work required for small purchases.

In the future, WPB announced on April 13, the small order procedure may be used in placing orders for Class A products containing up to 10 tons of either carbon or alloy steel rather than up to three tons or less of carbon or 1200 lb. or less of alloy steel, as was formerly permitted. The limits on aluminum that may be contained in Class A products purchased under the procedure has been increased from 500 lb. to 2000 lb. A new limit of 1000 lb. has been established for copper wire mill and brass mill products, while the limit on copper and copper base alloy foundry products remains at 300 lb.

Purchases of Class A products under the small order procedure are still subject to the other restrictions in the regulation. Specifically, the procedure may not be used to get from suppliers more of the same Class A product for use in the same authorized production schedule during the same calendar quarter than can be made from the amounts of controlled materials specified as limits for the use of the procedure. These changes are spelled out in amendment 1 to CMP Regulation 1, as amended Feb. 2, which also indicates that a producer of controlled materials in the forms and shapes of steel may fill an order for steel that a distributor would be authorized to fill under paragraph (d) (4) of CMP Regulation 4 if the producer can bill such orders from mill stock and he makes a practice of filling orders from his stock.

Provisions of CMP Regulation 1, with respect to sample orders have been revoked by the amendment. Persons who desire controlled materials for testing and experimental purposes may obtain them under the provisions of order P-43, which provides methods for use by laboratories in obtaining materials. Several other minor changes in the regulation have been made for the purpose of clarifying it and conforming its provisions to changed WPB policies.

•

WPB Defines "Steel"

Washington

• • • **Conforming** to the definition used in the M-21 series, WPB for the purpose of clarification has defined "steel" as used in CMP Regulation No. 1 as meaning all carbon steel (including wrought iron) and alloy steel in the forms and shapes that are designated as controlled materials (these designations are contained in Schedule I of CMP Regulation No. 1).

The term includes all types of rejected or second quality material and shearings, except when sold as scrap for remelting or when sold to a dealer for sorting or processing or for resale as scrap for remelting. The term includes material (in the forms and shapes indicated in Schedule I) salvaged from scrap and sold for other than remelting purposes, except that it does not include material that has been in use or service.

•

WPB Permits Wider Use Of Metals in Industrial Items

Washington

• • • **To improve** quality and performance of conveying machinery and power transmission equipment, restrictions on the use of iron and steel in bunkers, conveyor structures, and other items were lifted. Restrictions were also lifted on the use of alloy steels for chain and sprockets. An amendment to order L-193 covered these changes.

The exchange of leased container machinery and equipment requiring reconditioning for new, reconditioned, or rebuilt units of the same size and type without preference ratings is permitted under the amended order L-332.

Cast iron for washing fountains and oil, plaster, and grease interceptors for plumbing fixtures is permitted under an amendment to schedule XII of order L-42. At the same time, restrictions on the use of metal in wash fountains to 25 lb. were removed because of the high rate of breakage of concrete bowls.

The dollar value of repairs and maintenance parts for paper-mill machinery under L-83 has been increased from $100 to $2,000, with greater repairs permitted in event of actual breakdowns.

Individual production quotas totaling about 200,000 electric flat irons to be made during the remainder of 1944 are expected to be issued to nine manufacturers this week.

Restrictions on the use of seamless steel tubing and wall thickness of the tubing were removed for the manufacture of coil or tube assemblies for refrigeration condensers and coolers under the amended order L-126.

Amended order L-78 removes former prohibitions on the use of metal to close the ends of reflectors, and in shields, louvers, and baffles of fluorescent lighting fixtures. However, types of fixtures are further restricted.

Priority Changes

Cartridge fuses—Time delay non-renewable cartridge fuses have been redefined by WPB. Int. 2 to L-161. (4-12-44)

Container machinery—Equipment requiring factory rebuilding or reconditioning may be exchanged for new units of the same size and type without first obtaining a preference rating order. L-332, as amended. (4-12-44)

Conveyor machinery—Restrictions on the use of iron and steel in bunkers, conveyor structures, and on alloy steels for chain and sprockets have been removed. L-193, as amended. (4-12-44)

Machinery parts—Delivery of parts for maintenance or repair of paper mill machinery has been raised from $1000 to $2000. Orders above that amount require approval and an assigned rating on WPB form 1319. L-83, as amended. (4-13-44)

Petroleum pumps—Restrictions on the use of dispensing pumps and tanks for gasoline and other petroleum products have been eased. PAW Order 12, as amended. (Release No. OWI-3091, PAW-423)

Plumbing equipment—Substituting one type of heating system for another is prohibited by WPB if the substitution requires the replacement of a usable distribution system. L-79, as amended. (4-13-44)

Plumbing fixtures—Cast iron interceptors may be manufactured for plumbing fixtures, and restrictions limiting the amount of metal permitted in wash fountains have been removed. Sched. 12 to L-42, as amended. (4-12-44)

Railroad allocations—Railroad operators have been authorized to place orders for additional track materials, up to 20 per cent of approved allocations, to balance an additional quantity of new rail expected to be allocated during the third and fourth quarters. Dir. 2 to P-142. (Release No. WPB-5416)

Steel strapping—Steel strapping is now permitted for domestic shipments of 90 lb. and less. M-261, revoked. (4-12-44)

Alarm clocks—Definite routines and procedures for production and distribution of new spring driven and electrically operated alarm clocks have been established. L-275. (4-14-44)

Fluorescent lighting fixtures—Former prohibitions on the use of metal to close the ends of reflectors, and in shields, louvers and baffles in fluorescent lighting fixtures have been removed. Permitted sizes are further restricted. L-78, as amended. (4-14-44)

Jewel bearings—Production of watt-hour meter cups has been freed from control. M-50 as amended. (4-14-44)

Radio and radar equipment—Revision brings table 9 into conformity with changes made in scheduling procedures in a previous amendment. Table 9 to M-293. (4-15-44)

CMP Delivery Restrictions Clarified

Washington

• • • **Because of** misunderstanding of provisions which govern deliveries of materials, Walter C. Skuce, WPB director of the CMP Division, has issued a statement in connection with Interpretation No. 7 as amended April 14 to Priorities Regulation No. 1. Mr. Skuce called attention to the fact that these interpretations do not place in a producer's hands the right to ship quantities of materials in advance of delivery dates requested by the customer or in quantities greater than are agreed upon by the producer and the customer.

There will be no violation of WPB inventory restrictions, it was pointed out, if two rules are recognized:

1—The customer is not required by any WPB order to accept more materials than are covered by his purchase order. However, he has the right to order the minimum production quantity which the producer is authorized to make and ship to meet the customer's requirements if it is not practicable for the customer to get the item from any supplier in the small quantities which he presently needs.

2—A supplier may reject his customer's order if it is less than the minimum which he regularly sells, as explained in Interpretation 3 to Priorities Regulation No. 1. The supplier does not have to accept orders which either total less than a minimum production run or which call for individual deliveries of less than a minimum production run.

Furthermore, the customer's right to accept deliveries of materials or products at earlier dates than they are actually needed does not affect the contractual relationship between the customer and his supplier in any way, according to Interpretation 7, as amended April 14, to Priorities Regulation No. 1.

Price Briefs

Bedsprings—Double deck coil bedsprings with metal frames have been given dollars-and-cents maximum prices at manufacturers, jobbers' and retailers' levels. Amdt. 1 to RMPR 213. (Release No. OPA-4161)

•

Folding cots—Manufacturers of metal folding cots, metal rollaway cots and metal double deck beds have been given specific maximum prices. Order 1470 to MPR 188. (Release No. OPA-T-1948)

•

Inventory reports—A consolidated form containing inventory information needed by WPB and sales reports for review by OPA, to be filed for sales of selling second hand machines or parts, used industrial sewing machines, used pressure vessels, and enclosed atmospheric pressure vessels, will now be used. Amdt. 114 to MPR 136; Amdt. 4 to MPR 465; Amdt. 2 to MPR 375, and Amdt. 1 to Licensing Order 3. (Release No. OPA-4162)

•

Manganese and chromium ores—Transactions involving the sale or delivery of 500 lb. or less of either metallurgical manganese or chrome ores are now exempted from price control. Amdt. 4 to MPR 248 and Amdt. 4 to MPR 258. (Release No. OPA-1939)

•

Nonferrous castings—Small orders for nonferrous castings—known in the industry as nuisance orders—have been exempted from price control by OPA, within certain specified limits. Amdt. 4 to RMPR 125. (Release No. OPA-T-1943)

•

Aluminum alloy—A ceiling price of 15c. per lb. for a new primary grade aluminum alloy ingot, alloy No. 356, has been established. Amdt. 4 to MPR 2. (Release No. OPA-T-1955)

•

Basic refractories—Ceiling prices for two additional named brands, Basimix and Basiplast, of magnesite hearth ramming mix have been established. Amdt. 4 to Reg. 416.

Additional Track Materials Permitted to Railroads

Washington

• • • **Railroad operators** have been authorized to place orders for an additional quantity of track materials, up to 20 per cent of approved allocations for such equipment as frogs, switches, and other items, to balance an additional quantity of new rail, it is anticipated will be allocated to them during the third and fourth quarters of 1944.

The action, covered by issuance of Direction 2 to order P-142, states that such orders for track materials are not to be confused with track accessories, nor can such orders for track materials be used to obtain any equipment other than to accompany the quantity of new rail which may be authorized for each railroad operator, the WPB said.

•

Rail Rates for Warehouse Steel Shipments Simplified

Washington

• • • **Iron and steel** warehouses and jobbers were given OPA permission on April 4 to use the lowest filed or published tariff rate of freight plus 3 per cent of the rate in computing delivered prices, in an amendment to price schedule 49. The action, OPA said, removes any question of liability under the revenue laws for misrepresentation of payment of the federal transportation tax by a reseller in a delivered sale where the freight factor may not be the same as freight actually paid. The amendment is effective April 8.

Some question has arisen of whether sellers were permitted to include the federal tax in maximum delivered prices for sales to the United States, inasmuch as the revenue laws previously exempted government shipments from the transportation tax, OPA said. This change was made by the 1943 Revenue Act. The price action authorized the addition of 3 per cent of the rate of rail freight in computing delivered prices, whether the tax actually has been paid or not.

•

Steel Orders Eased to Permit Output of Prohibited Articles

Washington

• • • **Slight liberalization** of order M-126 (Iron and Steel Conservation) to permit the manufacture of a few heretofore prohibited articles was announced by WPB on March 31. Articles which may be made of steel under the amendment are awning frames and supports at the rate of 75 per cent of 1941 production; window and roller type shades for street cars and buses; stencils; cigarette lighters; and commercial size mop wringers (but not household size). Another change in the amended order continues permission to manufacture steel laundry tags and badges which otherwise would have been prohibited by the revocation of order L-91. Correction of a typographical error permits the use of low-grade wire in hat brims. The order had read "military" instead of "millinery."

Amendment of order M-126 permits the use of small quantities of steel for items which are deemed essential at this time. In some cases the steel will come from idle and excess inventories and in others from new supplies, but these amounts are small. In some cases the substitution of steel for other materials will relieve pressure on supplies of materials more scarce than steel.

CMP Developments

Small orders—Amounts of controlled materials which may be contained in Class A products have been adjusted to reduce paper work required for small purchases. Amdt. 1 to Reg. 1. (WPB-5445)

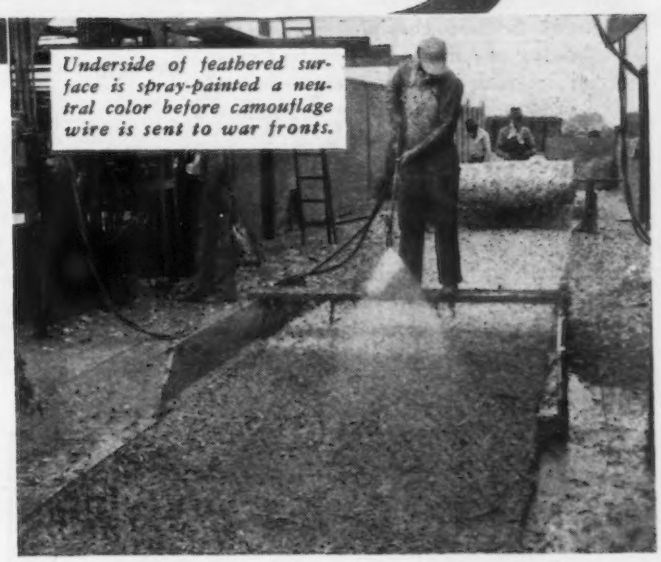
•

MRO supplies—The procedure under which repairmen purchase controlled materials, other materials, parts and sub-assemblies, has been amended so that they may obtain materials with which to recondition or rebuild damaged or used items for resale. Reg. 9A, as amended. (Release No. WPB-5464)

Wire is coated with sticky asphalt emulsion before it is passed under the hopper which applies the chicken feathers.

Spray-painting the camouflage pattern over the blanket of feathers with DeVilbiss Spray Painting Equipment.

How to hide death ...with chicken feathers!



Underside of feathered surface is spray-painted a neutral color before camouflage wire is sent to war fronts.

SOMEBODY ought to erect a monument to the chicken. They give us eggs. They give us meat. And now they're even giving their feathers to hide our artillerymen and their death-dealing guns from enemy aerial reconnaissance!

Every day, in Southern California, countless billions of chicken feathers are affixed to 150-foot lengths of chicken wire by Pacific Crane and Rigging, Inc. The feathered surface is spray-painted in a camouflage pattern and the underside in a solid, neutral color. The camouflaged blankets of feathers are then shipped in rolls to battle zones where they are used to conceal military installations from the prying eyes of enemy flyers.

Applying the camouflage pattern to the feathers is the most important part of this unique process, which was developed by U. S. Engineers. So naturally, Pacific Crane and Rigging chose DeVilbiss Spray Painting Equipment for the job. Because of the accuracy of their control, the DeVilbiss guns can lay down a uniform camouflage pattern—without disturbing the feathers.

Chances are *you* won't ever have chicken feathers to paint. But whatever product you do have that requires painting or coating—now or after conversion to peacetime production—you will find the job can be done better *and faster* with a modern DeVilbiss Spray System.

ARMY (E) NAVY

THE DEVILBISS COMPANY, TOLEDO 1, OHIO
Canadian Plant: Windsor, Ontario

DE VILBISS
Spray Systems

SPRAY EQUIPMENT • EXHAUST SYSTEMS • AIR COMPRESSORS • HOSE & CONNECTIONS

Quick Disposal of Contractor-Owned Property Achieved in Chicago Area

Chicago

• • • **Established channels** of distribution are afforded full protection in disposal of surplus material arranged by the Chicago Ordnance District, examination of the district's procedure shows.

About 90 per cent of the transactions facilitated by the district's sales and salvage section concern material owned by contractors whose ordnance contracts have been terminated, title to the material remaining with these firms. The remainder represents material to which title is vested in the government, usually as a result of termination or completion of cost-plus-fired-fee contracts. Ordnance practice contrary to that of other military contracting agencies, particularly the Army Air Forces, has not favored cost-plus contracts, explaining the limited amount of material resulting from this source. The ordnance district does not maintain material warehouses.

The Ordnance district usually comes into the disposal picture when a contractor presents it with an inventory of surplus material for which reimbursement is requested because of termination. In many cases, the contractor already has made strenuous efforts to dispose of this material himself through the WPB redistribution division or by other means. In cases where such disposal has been possible, or in which the contractor is able to use the material in an ensuing contract or for his own production, no claim for reimbursement is made to the Ordnance district and the district does not enter the picture.

On material for which claim for reimbursement is made, however, Ordnance first screens its other contractors with the hope that one of them may be able to use it. Failing this, the material list is forwarded to all manufacturing arsenals, Ordnance field service, and to neighboring Army posts, camps, and stations.

If no response is received, the contractor is given authority to return the material to its vendors at cost less a reasonable handling charge.

If the material cannot thus be resold, its disposal is turned over to the sales and salvage section of the Ordnance district. The cardinal tenet of this section appears to be that it will deal only with established channels of supply. Thus, material referred to the section at this point in the procedure is not dumped on the market without regard to purchaser. A negotiated sale is attempted, in the case of steel, first to the mills, then to steel warehouses. The district maintans a list of recognized primary and secondary warehouses within its boundaries, which roughly corresponds to rosters of the American Steel Warehouse Association and Steel Products Warehouse Association, Inc., respectively. Primary warehouses are canvassed in rotation, at least three of them being given an opportunity to purchase each lot of material; then the procedure is duplicated on the secondary warehouse list. If the warehouses fail to absorb the material, it is, if suitable, offered to structural steel fabricators in the same manner. Any offer exceeding the scrap value by a reasonable amount, the exact figure depending upon circumstances, is accepted. For guidance in complex disposal matters, and to guard against improper disposal of specialty items, the prime and secondary warehouse groups have each been asked to form an advisory body of five men. These individuals are consulted whenever a knotty problem is posed.

If no transaction can be arranged at this level, the contractor is directed to sell it to a recognized scrap broker with a warranty clause providing that the material must be resold as scrap and not reclaimed.

When sales can be negotiated with normal trade outlets, the contractor holding the material is told of the price at which the transaction has been arranged, and notified that Ordnance will pay him the difference between this price and the price at which he originally bought the material.

Goal of the OrdnanceDistrict in contract terminations is completion in 90 days. The usual turnover on surplus material is 10 days. This may be one reason why the district prefers that individual small consumers deal with the contractors through the WPB redistribution division, or procure their requirements through established warehouses.

Disposal of material by the Army Air Forces Materiel Command differs somewhat in procedure, although the paramount aim of speed is the same. There is a difference also in that material commonly is supplied by the Air Forces to the contractor and is government owned. Upon termination, effort is made to dispose of the material to other Air Forces contractors and to other war contractors. Liaison is maintained with the Ordnance Department to facilitate this aim.

When material cannot be disposed of through these channels, the sales branch, property disposal section, classifies it, circularizing possible buyers in each classification with notice of location, disposal period, and date upon which sealed bids will be received. Bids are submitted in triplicate within a maximum of 15 days of circularization, and may be made f.o.b. location or destination. If the property purchased is scrap, the purchaser is required to execute a scrap waranty. The "best" bid is accepted, preference being given to bidders engaged in war work.

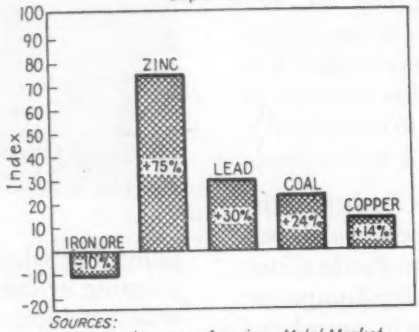
Navy surplus material disposal follows a somewhat similar pattern,

(CONTINUED ON PAGE 136)

LOW LEVEL OF IRON ORE PRICES DEPICTED: *These charts were published in the annual report of Cleveland-Cliffs Iron Co., emphasizing the low level of iron ore prices as compared with other minerals.*

COMPARISON OF RAW MATERIAL PRICE TRENDS SINCE OUTBREAK OF WORLD WAR II

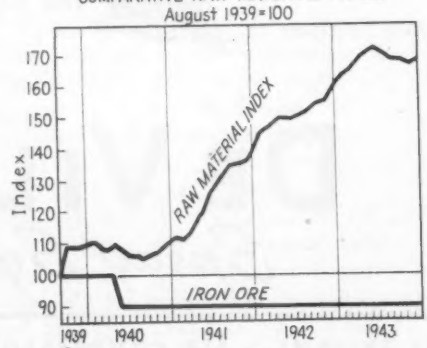
September 1939



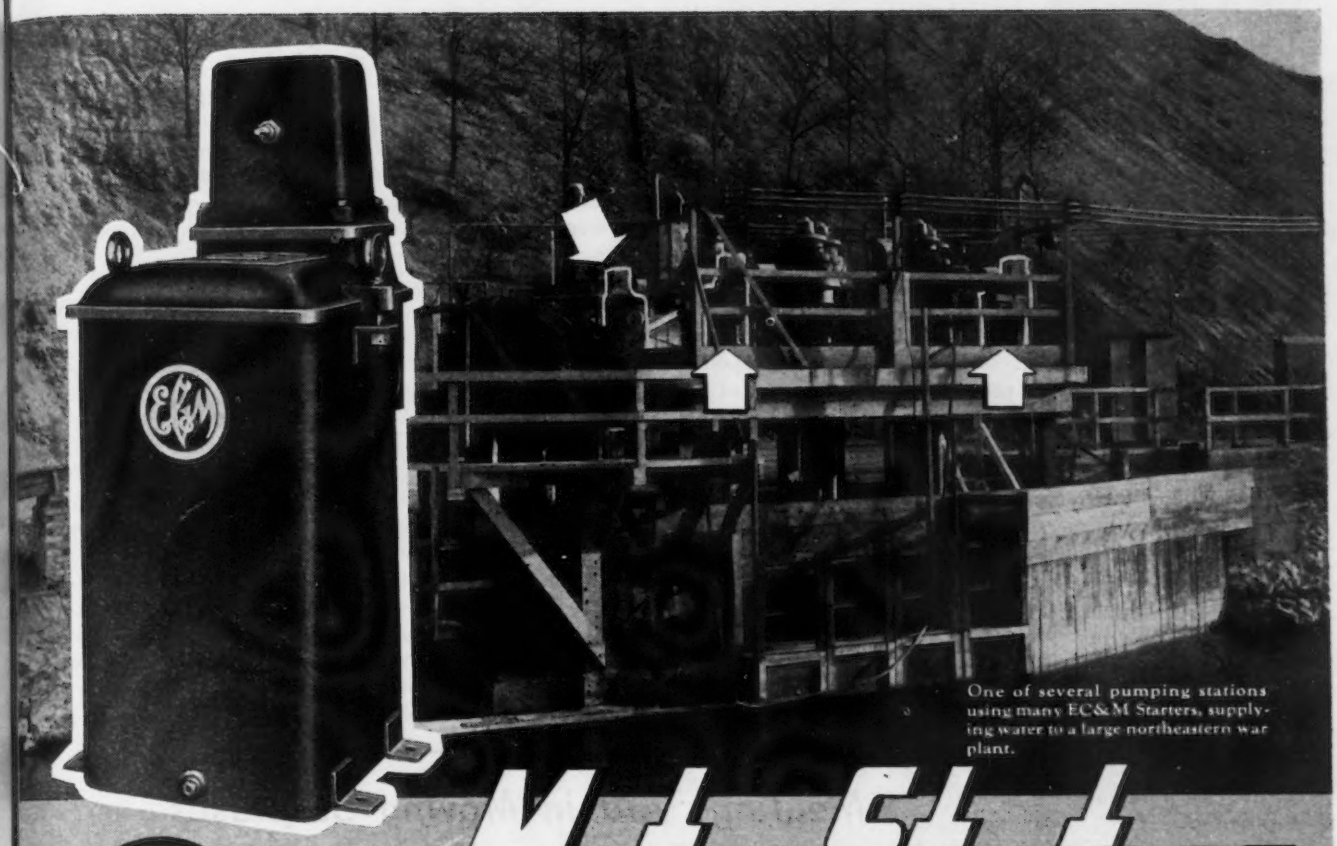
SOURCES:
Zinc, lead, copper - American Metal Market
Coal - U.S. Dept. of Labor
Iron ore - Iron Age

COMPARATIVE RAW MATERIAL PRICES

August 1939 = 100



SOURCES:
Raw material - U.S. Dept. of Labor
Iron ore - Iron Age

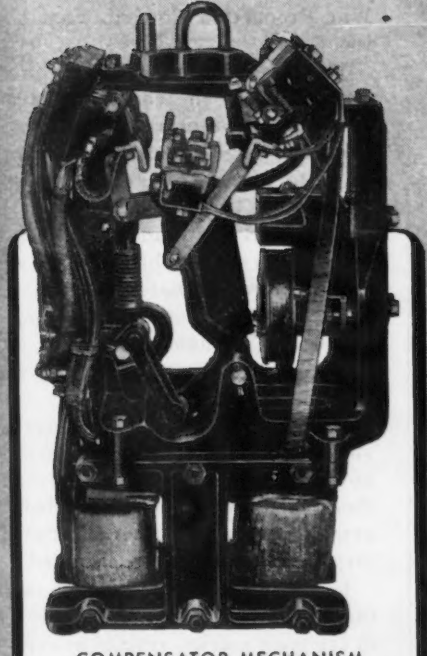


One of several pumping stations using many EC&M Starters, supplying water to a large northeastern war plant.

REDUCED VOLTAGE Motor Starters

SERVE OUTDOOR PUMPING STATION....

No Control Room Needed



COMPENSATOR MECHANISM

Single, quick-break, double-throw Contactor operated by a *single* magnet. Quick transfer from reduced voltage starting to full voltage running by a throw-over spring and a mechanical latch tripped by a current limit relay.

DAY in and day out, in the freezing winter, in the sizzling summer heat and the torrential rains—under all weather conditions—these EC&M Starters operate successfully.

They are simple, completely wired units, totally enclosed and oil-immersed in steel tanks.

Total oil-immersion of the compensator-mechanism not only permits interrupting the circuit under oil (recognized as an effective means for breaking alternating currents), but also provides continuous lubrication for all operating parts of the mechanism and protects them from dust, moisture and corrosion.

Wherever moisture, corrosion and dust must be combated, these EC&M Starters provide fool-proof, dependable operation. *Ask for Bulletin 1045-B.*

THE ELECTRIC CONTROLLER & MFG. CO.

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but differs markedly from Ordnance Department operations in that no contractor-owned material is involved. Following contract cancellation settlement, title passes to the Navy Department and the wheels of disposal then begin to turn.

First the particular Navy bureau concerned attempts to shift the material to its contractors. Then, the Bureau of Supplies and Accounts, given the listing, contacts other Navy bureaus, retaining the balance for disposal through other channels. These include the Army, and the Treasury Department Procurement Division. If, after 30 days, no sale has been made in this manner, disposal is effected through the Material Redistribution and Disposal office of the Bureau of Supplies and Accounts. Unless the item concerned is classed as a military necessity, a sealed bid sale is held.

It is difficult to estimate the total amount of material resulting from contract terminations which has been disposed of in this area, because so much of it has been sold by the contractors, and hence has not come into the hands of the military contracting agency for disposal. Probably the largest contract termination in the mid-west involved an Ordance Department tank contract with International Harvester Co., cancelled about a year ago, amounting to $217 million. Twelve Harvester plants were engaged in the program, and 437 subcontractors were concerned. The total commitment of the company to subcontractors alone aggregated $90 million. By now, all material involved has been sold either by the company's own efforts or with the the help of the Ordnance District. Much of it necessarily went as scrap. This company maintains a contract termination organization at each of its plants, and each contract is handled separately. The plant termination organization consists of representatives of the store keeping, accounting, production, and mechanical engineering departments. Disposal of surplus material, handled at plant level, consists of several steps. First, decision is made as to whether the material can be utilized in the company's vast operations, and, if so, it is retained at full cost. If this is not possible, all Harvester plants are canvassed, and it is suggested that the subcontractors involved do likewise. Then, an effort is made to dispose of the remaining surplus by resale to suppliers. If suppliers are unwilling to repurchase the material—although a large number of them have been eager to add it again to their depleted stocks—other manufacturers are canvassed.

The cumulative result of disposal efforts outlined above by all of these agencies has been to wipe the slate clean nearly as fast as terminations occur, preventing any large stocks accumulating to hang as a Damoclean sword over the heads of trade distributors. Possibly the largest single steel item resulting from a program termination appeared on the market last fall. It was narrow cold rolled strip of special analysis and temper and possibilities of its disposal for normal manufacturing operations in years to come were extremely limited. Most of this material found its way back to the mills for remelting.

Meetings Aid in Moving Surpluses

• • • **The Aircraft** Scheduling Unit, operating through Materials Distribution Branch of the Production Division, Materiel Command, Wright Field, Dayton, Ohio, reports that it is expanding its redistribution activities.

On the West Coast the Army Air Forces Western Procurement District in conjunction with the Aircraft War Production Council, West Coast, Inc., is conducting weekly meetings in Los Angeles. At these meetings representatives of the aircraft companies in the area present lists of idle surplus material and their production requirements.

In the east a somewhat similar procedure is in effect through the cooperative activity of the AAF Eastern Procurement District and the Aircraft War Production Council, East Coast, Inc.

This method of screening production needs of one contractor against the surplus material held by another has been augmented in a number of ways to afford the greatest possible coverage of the entire industry.

The WPB has made it possible for exemptions to be obtained for material involved so that it may be channeled into immediate production. The Materiel Command has also established contacts with the Air Service Command, Aviation Supply Office, Signal Corps and other technical services, and appropriate civilian and governmental agencies to determine their needs which may be filled with available surplus material. Satisfactory results have been obtained.

Under current procurement policies the issuance of authority for purchase in the open market results in expenses not encountered when these materials can be found in surplus stocks, many of them government-owned. Two objectives are accomplished: Material which would normally lie idle is used in production and maintenance; and, the cost of procurement is greatly reduced.

Railroad Purchases of Iron, Steel Dip in 1943

Railways of Class I—Source: Association of American Railroads

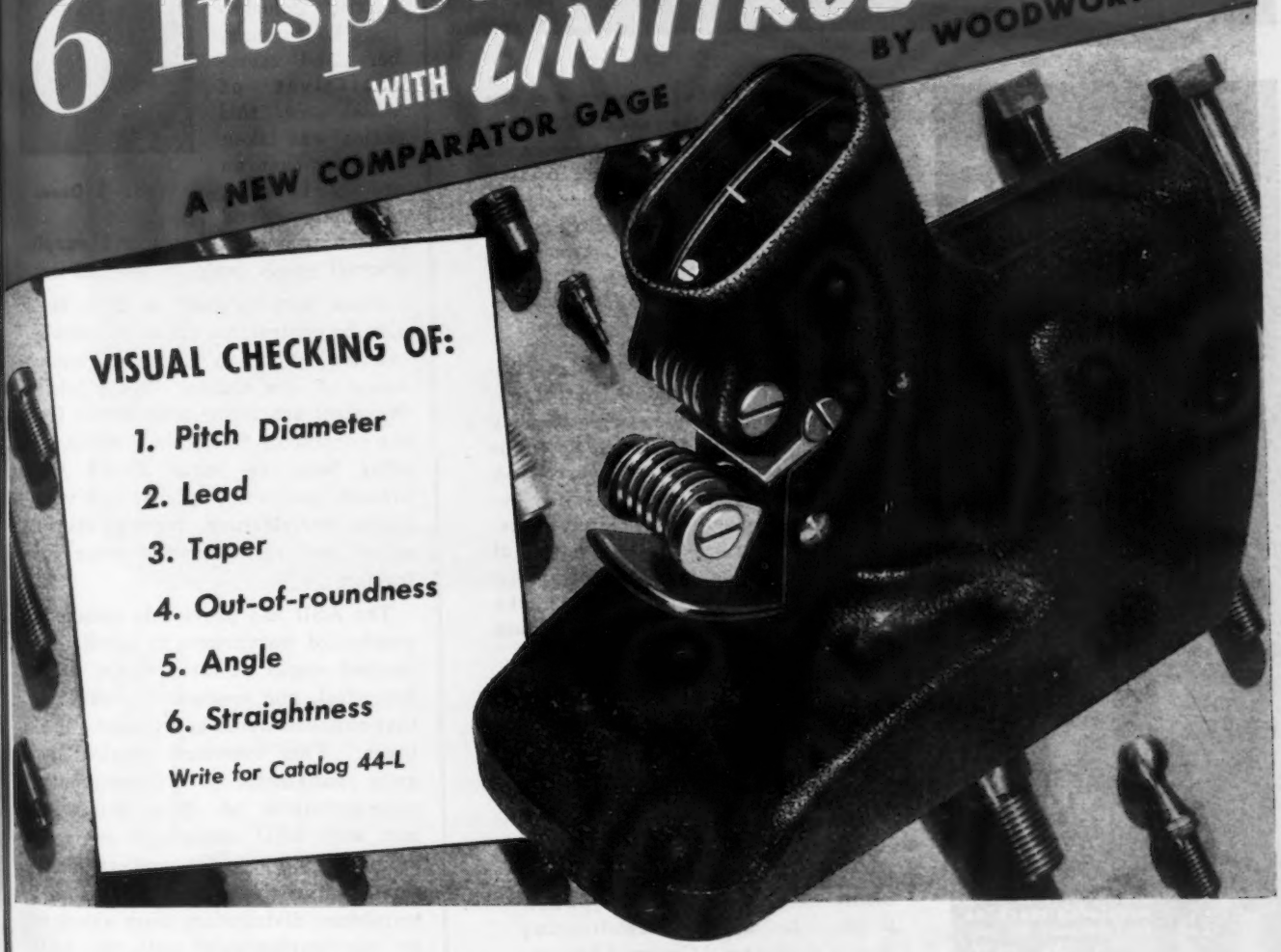
IRON AND STEEL PRODUCTS. Item	1943	1942
Steel rail (new & second hand, except scrap)	$60,074,000	$55,647,000
Wheels, axles & tires	44,550,000	41,501,000
Frogs, switches & crossings & parts of same	22,919,000	16,978,000
Track fastenings, track bolts, spikes, etc.	43,804,000	53,349,000
Iron bridges, turntables & struct. steel, all kinds	3,827,000	3,183,000
Bar iron & steel, spring steel, tool steel, unfabricated rolled shapes, wire netting & chain, except light coil, boiler, firebox, tank, & sheet iron & steel, all kinds	28,868,000	27,120,000
Forgings & pressed steel parts for locomotives	3,414,000	4,514,000
Car forgings, iron & steel and fabricated or shaped steel, for passenger & freight cars	11,367,000	16,963,000
Flues & tubes for locos. & stationary boilers	6,450,000	6,674,000
Interlocking & signal material	18,152,000	21,245,000
Telegraph, telephone & radio material	2,832,000	4,213,000
Bolts, nuts, washers, rivets, lag screws, pins & studs	11,481,000	13,452,000
Springs, helical & elliptical, all kinds for locomotives & cars	5,592,000	5,174,000
Locomotive & car castings, beams, couplers, frames & car roofs	49,440,000	61,359,000
Track & roadway tools, all kinds, miscellaneous track material & wire fencing. Motor, hand, push & velocipede cars & parts for same	8,440,000	9,174,000
Machinery & repair parts, including all power driven shop machinery	4,383,000	4,066,000
Machinery, boilers, repair parts & all other iron & steel products	11,384,000	11,980,000
Pipe, iron & steel & fittings, all kinds	7,118,000	7,642,000
Hardware, all kinds, including nails	6,255,000	5,074,000
Hand & small machine tools, such as drills, taps, reamers, dies, chasers, including air tools & parts	10,265,000	10,107,000
Air brake material	21,552,000	25,363,000
Standard & special mechanical appliances for locos.	18,478,000	18,730,000
Automotive equipment & supplies	10,158,000	9,581,000
Total Iron and Steel Products	$410,803,000	$433,089,000

LEFT: Girls inspect thousands of precision machined parts daily with LIMITROL.

RIGHT: Hand model used for "in process" gaging.

6 Inspections in One WITH LIMITROL

A NEW COMPARATOR GAGE BY WOODWORTH



VISUAL CHECKING OF:

1. Pitch Diameter
2. Lead
3. Taper
4. Out-of-roundness
5. Angle
6. Straightness

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N. A. WOODWORTH CO., SALES DIVISION, 1300 E. NINE MILE ROAD • DETROIT 20, MICHIGAN

PRECISION GAGES • GROUND THREAD TAPS • FORM TOOLS • PRECISION MACHINED PARTS • HEAT TREATING • PLATING

Warehouses Asked to Handle Surpluses

Cleveland

• • • **The American Steel Warehouse** Association, Inc., through its chairman, Walter S. Doxey, made an appeal recently for warehouses with space available to relay this information to Lt. Col. A. E. R. Peterka, chief of the Material Distribution Branch, Resources Control Section, Dayton, Ohio. Following a meeting of Aircraft Scheduling Unit members and representatives of warehouses, this action was taken in order that an orderly handling of the storage and redistribution of excess and surplus aircraft steels could be worked out.

Walter S. Doxey

Some surplus steel is now being used by contractors either to complete existing orders or to meet requirements of new orders. Other lots of this steel are being transferred from one contractor to another, while still other lots are being moved from present locations to plants and warehouses for cleaning, sorting, classification, and reshipment to other contractors.

The ASU had previously selected a number of warehouses to handle earmarked stocks of alloy steels, stainless steel, and mechanical tubing so that supplies would be available at all times. This expedient worked out quite satisfactorily. Consequently, representatives of these companies met with ASU officials to evolve a practical method for redistributing surplus stocks. The result was that warehouse distributors were asked to go into "partnership" with the ASU in developing a program for moving surplus stocks.

Larger items will be selected from larger inventories and moved to warehouses for redistribution. These items may range from 10 to 50 tons and in some instances may have to be cleaned, sorted, and otherwise handled to make them suitable for resale. The steel shipped to warehouses will have to be restored in every way to

Blockbusters OF WAR AND INDUSTRY!

These are filters—not projectiles. But projectiles might never reach their destination if these filters did not do their jobs first. They are a small but vital contribution to the huge war machine we have built to control the air . . . the field . . . and the seas.

The four plants of The Weatherhead Company have been making filters by the hundreds of thousands as one of its many contributions to the nation's war effort. Peace will find us prepared to resume making filters—and scores of other mechanical parts—for the machines that will reconstruct the world!

FREE: *Write on company letterhead for "Seeds Of Industry"—a history of The Weatherhead Company, its many facilities and diversified products.*

Look Ahead with

Weatherhead

THE WEATHERHEAD COMPANY
CLEVELAND, OHIO

Manufacturers of vital parts for the automotive, aviation, refrigeration and other key industries.

Plants: Cleveland, Columbia City, Ind., Los Angeles. Canada—St. Thomas, Ontario

Daily Steel Payrolls Higher in February

• • • February steel payrolls totaled $137,615,000. In January, the total payroll was $141,794,000. The average paid out per day in February was higher than in January. Employment averaged 583,000 in both January and February of this year. In February, 1943, the industry employed a total of 635,000 men and women, a figure which is not directly comparable with the 1944 figures which represent *average* employment during the months rather than the total.

Wage earners in steel worked an average of 47.0 hours per week in February, against 45.7 hours per week in January.

Wage-earning employees earned an average of 116.1 cents per hour in February, compared with 116.5 cents per hour in January. All these figures are by the American Iron and Steel Institute.

meet standards required of new steel coming from a producer.

Most of the steel to be handled in this manner is government owned and will remain the property of the government. No investments will be necessary on the part of the warehouses to handle the steel. ASU will supply accounting officers and inspectors who will be responsible for analyzing and certifying the steels. Compensation to the warehouses for handling, storing, and reconditioning and shipping the steel will be on a commission or a fee basis. Mill orders will be screened against surpluses in warehouses.

Group Named to Handle Contract Termination

• • • A committee has been formed to determine administrative policy in contract termination, cancellation, and surplus property disposal in the merchant shipbuilding program, the Maritime Commission announced.

Wade H. Skinner, general counsel, will serve as chairman. Other members are R. Earle Anderson, director of the Division of Finance; C. E. Walsh, Jr., director of the Procurement Division; Lt. Comdr. A. G. Rydstrom, member of the Price Adjustment Board; Allen D. MacLean, director of the Production Division, and Lt. William Weber and Joseph S. Wilson, assistants to Rear Admiral H. L. Vickery, vice chairman of the Commission in charge of construction.

Sure—THOSE GEARS ARE Right!

Bullard Type "D" Mult-Au-Matic machining Alloy Steel Gears in the plant of a large Southwestern manufacturer.

They're Alloy Steel — and the Mult-Au-Matic Machines Them 30 to 40 an Hour

It takes plenty of gears to turn the many wheels of America's all-out war effort. And they have to be precision made to do their job.

Producing those gears . . . faster . . . at lower cost . . . with dependable accuracy . . . is just one of the many tasks for which industry is using the Bullard Mult-Au-Matic. For with the Mult-Au-Matic 6 stations—or 8—work simultaneously; hence, one operator with one machine, does the work which by other methods require several.

Quickly adaptable, the many Mult-Au-Matics now engaged on war production will be ready to lower the cost of many new products after the war is won. Although some of the work will be different, Mult-Au-Matic precision will be, as now, inherently and completely *right*.

THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT, U.S.A.

War Veterans Spur Production of Tools

Chicago

• • • **Diamond Tool Co.**, Chicago, needs workers as badly as any plant in that Group 1 labor shortage area, but when two discharged war heroes were rehired recently, their old jobs weren't waiting. A far greater contribution to the war effort could be made, the company felt, by giving these men the assignment of bringing home the war to workers throughout the mid-west.

Both Raymond E. Johnson and Robert Chapin, of the Navy and Marines, respectively, were decorated for bravery and services beyond the call of duty, and both were injured in action. Sheldon M. Booth, president of Diamond Tool, felt that stories of actual fighting experiences could convince war workers of the terrific cost of absenteeism and failure to maintain top production. The Navy agreed, but having no funds to reimburse these speakers, was overjoyed when the company agreed to put them on its payroll.

The heroes' appearances, according to Booth, by emphasizing the horror and hardships of war, have reduced absenteeism markedly and, in some cases, increased production as much as 20 per cent.

Johnson, who took part in the African invasion, was a member of a small group that volunteered to brave mountainous seas to cut a submarine net blocking a river mouth. Despite destructive gunfire from the shore, the group, after one failure, accomplished its mission, enabling a destroyer to enter the river.

Steel Co. of Canada Plans A New Continuous Strip Mill

Toronto

• • • **The Steel Co.** of Canada Ltd., has announced plans for the installation of a continuous strip mill at its Hamilton works as a postwar project. There is a possibility that work will be started before the war ends. The proposed mill will cost about $2,750,000 and will have a rated capacity of between 200,000 and 300,000 tons per year. The plate mill, put in production in April, 1941, will be a unit of the strip mill.

During March the Steel Co. of Canada established a new production mark in plate output, rolling 26,889 tons, to set an all-time record for Canada.

Titan Hot Pressed Parts

thick

or

thin . . .

Thick sections or thin, intricate shapes, sharp outlines, dimensional accuracy to surprisingly close tolerances are all normal in Titan engineering and production. Easy machinability of the dense, fine-grained metal, free from sand pits, blowholes or sand particles prolongs tool life, saves time and money. Titan will relieve you of the machining job if you wish. Send us your blueprints or a sample part and we'll quickly tell you how Titan can serve. You'll be pleased with the way Titan's friendly custom service will be adapted to your particular requirements.

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METAL MANUFACTURING CO.

BELLEFONTE, PA.

Quality Alloys by Brass Specialists

BRASS AND BRONZE RODS • FORGINGS • DIE CASTINGS • WELDING RODS

Additional Listings Of Government Surplus Disposal Offices

• • • **Additional channels** for disposal of government surplus property have been listed by the Chicago Association of Commerce, supplementing its Special Bulletin No. 6. Offices listed in the bulletin, which also outlines disposal procedures, were published in THE IRON AGE, March 30, 1944, pages 92-94. The additional listings follow:

Guide to Key Symbols

Goods sold are:
(NR) Non-reparable property
(SM) Surplus serviceable military and miscellaneous property
(SI) Serviceable industrial property

Sales arranged by:
(OB) Offerings and bids
(A) Auctions
(N) Direct negotiations
(L) Aid in locating industrial property

Ordnance Department

Milwaukee Regional Office:
Chicago Ordnance District,
322 East Michigan St., Milwaukee 2.
Telephone: Broadway 7400.
Att: Disposal & Salvage Branch.
(NR-OB—Also aid in disposal of inventories resulting from contract cancellations.)

Quad Cities Regional Office:
Chicago Ordnance District,
326 West Third Street, Davenport, Iowa.
Att: Termination Division.
(NR-SM-SI-OB-N)

Seattle Regional Office:
San Francisco Ordnance District,
501 Arctic Building,
3rd Ave. & Cherry St., Seattle 4.
Telephone: Maine 6565.
Att: Major Gish.
(NR-SI-OB-N)

Portland Regional Office:
San Francisco Ordnance District,
602 Bedell Building,
520 S. W. 6th Ave., Portland, Ore.
Telephone: Atwater 6431.
Att: Major Green.
(NR-SI-OB-N)

o o o

Army Engineers Corps

U. S. Engineer Office:
1709 Jackson St., Omaha, Neb.
Telephone: JA 8308.
Att: The District Engineer.
(SM-SI-OB-N)

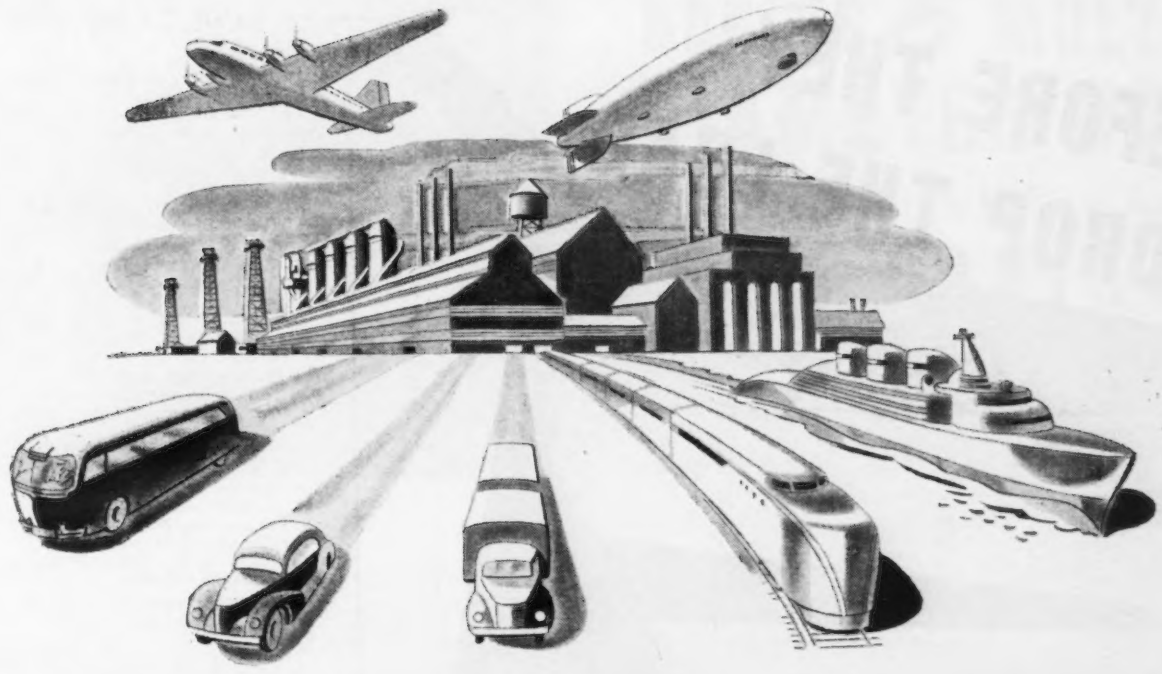
U. S. Engineer Office:
Penn Mutual Bldg., Philadelphia 1.
Telephone: Walnut 5270—Ext. 20.
Att: Captain Stuart M. Neagy, Redistribution & Salvage Officer.
(SM-OB)

U. S. Engineer Office:
Rock Island, Ill.
Telephone: R. I. 6440—Ext. 42.
Att: J. H. Grove, Administrative Assistant.
(NR-SM-SI-OB)

The District Engineer:
U. S. Engineer Office,
601 Davidson Bldg., Kansas City 10, Mo.
Telephone: HA 4175—Ext. 185.
Att: Mr. Paul E. Kunze, Section Head, Property Section.
(NR-OB)

U. S. Engineer Office:
New Federal Bldg., Pittsburgh.
Telephone: Grant 0800—Ext. 299.
Att: Major Wm. F. Schwerin.
(SM-OB)

U. S. Engineer Office:
428 Federal Bldg., Milwaukee 1.
Telephone: Broadway 8600—Ext. 257.



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FLUID POWER

Confine fluid in a closed system, apply power at one end, and you deliver power instantly at the other end.

That is Fluid Power—based on hydraulics—the 1944 way to get work done. Any kind of work—hard or easy, brutal or delicate. Precisely-timed work or remote-controlled work.

You can step Fluid Power up or step it down—to lift a tank or wind a watch. You can make it fit the job. You can flow it around corners and into tight places. You can regulate it, by valves, within precise limits.

TRANSMITTING FLUID POWER

Fluid Power is transmitted through tubes; it needs no shafts, gears, pulleys or belts. Tubes themselves are simple devices, easy to cut, bend, join or put in place.

But when a system of tubes is used to transmit Fluid Power, it calls for wrinkle-free bends, leak-proof fittings, precise operating valves, flow without obstruction. It gets to be an engineering job.

FLUID POWER ENGINEERING

That's been Parker's business for twenty years—designing Fluid Power tubing systems, engineering them, building valves and fittings, and making fabricating tools. Often we do the fabricating, too.

War demands have made industry more and more aware of the great number of things Fluid Power can do. For us, that has been the basis of a healthy growth in experience and knowledge, and the variety of our products.

Today, you'll find Parker-engineered Fluid Power systems in refrigerators and bombers, in chemical plants and locomotives—everywhere in industry.

LOOKING AHEAD

With at least one eye on the future, wouldn't you like to talk this through now with a Parker engineer? No matter what you make, or what kind of machines you operate, you are likely to find some interesting possibilities in the Fluid Power idea.

An interesting booklet, giving you more facts about Fluid Power, will be sent on request. Address Parker Appliance Co., 17325 Euclid Ave., Cleveland 12, Ohio.

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FLUID POWER ENGINEERING

Att: L. A. Rebholz, Chief, Surplus Materials Section.
(NR-SM-SI-OB-N)

The District Engineer:
U. S. Engineer Office,
Wright Field District.
P. O. Box 821, Dayton, Ohio.
Att: Captain Dwight W. Keller.
(NR-SM-SI-OB-N)

The District Engineer:
U. S. Engineer Office,
1st & Douglas Sts., N.W., Washington, D. C.
Telephone: Hobart 8000—Ext. 250.
Att: Captain C. Peters.
(NR-SM-OB)

The District Engineer:
U. S. Engineer Office,
Huntington 18, W. Va.
Telephone: 7143.
Att: Lt. Col. Harry Pockras.
(SI-OB-N)

The District Engineer:
U. S. Engineer Office,
Fort Norfolk, Norfolk 1, Va.
Telephone: 51411—Ext. 197.
Att: Lt. J. M. Gray, Property Officer.
(NR-SM-SI-OB-N)

The District Engineer:
U. S. Engineer Office,
Portland, Ore.
Telephone: Broadway 0621—Ext. 140.
(NR-SM-SI-OB)

U. S. Engineer Office:
P. O. Box 60, Vicksburg, Miss.
Telephone: 1850.
Att: Captain K. E. McLaughlin.
(NR-OB)

Mobile Engineer District:
Mobile, Ala.
Telephone: Mobile 6-44-21—Ext. 379-380.
Att: R. D. Schlegel, Equipment and Materials Section.
(SM-SI-OB-N)

U. S. Engineer Office:
Chimes Building, Syracuse 2, N. Y.
Telephone: 6-2161—Ext. 50 or 62.
Att: Captain A. L. Downey, Property Officer.
(SM-OB)

Miscellaneous Listings

Quartermaster Salvage Office:
Warehouse No. 38, Camp Blanding, Florida.
Telephone: 173.
Att: Salvage Officer.
(NR-OB)

Chemical Warfare Service:
Army Service Forces,
Huntsville Arsenal, Alabama.
Telephone: Huntsville 1980—Ext. 3227.
Att: Lt. J. W. Brown.
(NR-SM-SI-OB-N)

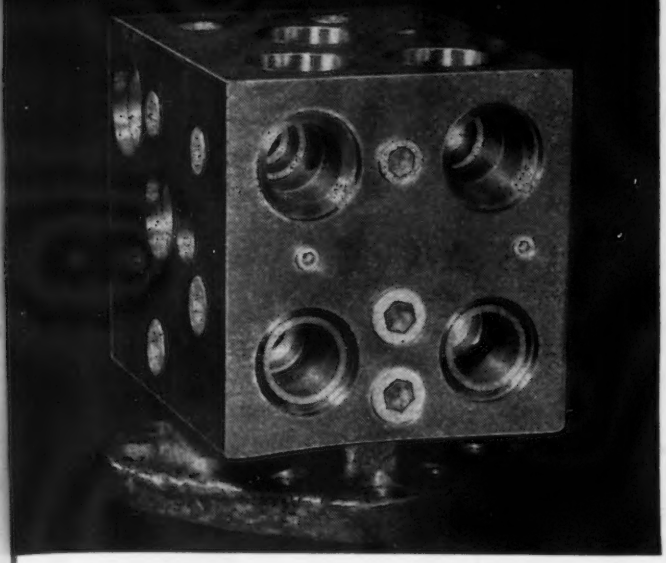
Army Air Forces:
Redistribution & Salvage Section,
Surplus Sales Branch,
P. O. Box 117, Wichita, Kan.
Telephone: 6-6661.
Att: Lt. Col. Frank J. Murphy, Redistribution & Salvage Officer.
(NR-SM-SI-OB-N)

Chief Supply Division:
Camp Gordon, Ga.
Att: Lt. Col. James F. Muller, Salvage Officer.
Telephone: 38611—Ext. 141.
(NR-OB)

Army Service Forces:
Headquarters, Eighth Service Command,
Salvage & Redistribution Division,
Dallas 2, Texas.
Att: Captain Harry E. Mogle, Chief, Redistribution Branch.
(NR-SM-SI-OB)

Office of the Salvage Warehouse:
Ft. Sheridan, Ill.
Telephone: Highland Park 5000—Ext. 102.
Att: Raymond N. Thill, Capt., QMC.
(SM-SI-OB)

Boston C.W. Procurement District:
Room 500, 75 Federal Street, Boston.
Telephone: Hub. 1380—Ext. 136-139.
Att: Capt. W. L. Maclachlan and Lt. F. W. Jones.
(NR-SM-SI-OB-A-N)



BORING 8 MULTIPLE DIAMETER HOLES

— at one setting — with 30% SAVING IN TIME

• • ANOTHER EXAMPLE OF THE TIME-SAVING, PRECISION PERFORMANCE OF THE AUTOMETRIC MODEL B

(Photos and performance data courtesy of C. B. COTTRELL & SONS CO.) Milwaukee, Wisconsin

Take a good look at the work-piece shown above—a centrifugally-cast steel unit requiring the precision boring of a total of 8 holes — 5 of them with multiple diameters and 3 holes (2 with 1½ inch diameters, 1 with 1¾ inch diameter; 7½ inches long) which must be held to within .0002 on the diameter throughout the entire depth.

Sure, it's a tricky job but a "natural" for the Autometric Model B Precision Jig-Boring Machine. The piece was rough drilled before being brought to the Autometric where it was finish bored to specifications—at one setting—with a 30% saving in time over other methods.

Such fast, precision performance is possible on the Autometric Model B because it is the only jig-borer, with a built-in rotary table, capable of boring holes on all sides of a work-piece *at one setting.*

Many shops consider the Autometric Model B as indispensable equipment for fast, precision boring of a wide variety of parts and pieces.

Autometric Model B Features:

★ Errorless measuring — more rapidly, more accurately — by the Autometric method.
★ Infinite variation of spindle speeds by fingertip control.
★ Infinite selection of feeds by fingertip control.
★ Hardened — ground — super-finished steel ways.

Write for complete information on the Autometric Model B Jig-Boring Machine.

Rotary Head Milling Machine
•
Autometric Jig Borers
•
Center Scope

Kearney & Trecker Products CORPORATION
Milwaukee, Wisconsin
Subsidiary of Kearney & Trecker Corporation

Milwaukee Face Mill Grinder
•
Milwaukee Midgetmill
•
Milwaukee Speedmill

Short Unemployment After War Expected

Boston

• • • **General Motors'** Alfred Sloan, Jr., told the Boston Chamber of Commerce April 6 he expected some general unemployment for the first six months after the war, but after that a resumption of full scale industrial activity lasting four or five years. He said General Motors plans to spend a half billion dollars after the war in increasing production capacity up to the point thought justified by post-war opportunities.

Alfred P. Sloan, Jr.

"I can't," he said, "say I am particularly enthusiastic about the policy of the OPA. It is moving toward control of the profits of industry. I rebel against it. If the price structure is destroyed, we'll be faced with tremendous difficulties." He scouted what he called the popular misconception that big business has made "a lot of money out of the war."

Mobilization for peace and quick re-employment after the war, he added, depends a great deal on the intelligence with which the government administers its rules and regulations, and an overhauling of the present tax structure, which he called "a hodge-podge of inconsistency."

Speaking of the possibility of inflation, Mr. Sloan said, "if we at General Motors are forced to increase wages above the 20 per cent we have already granted, we should have that based on prices rather than take it out of our own profits."

Electric Furnace Capacity To Hit 140,000 Tons a Month

• • • **Excess electric** furnace capacity built and being built ranges from 110,000 to 140,000 tons a month, according to a WPB Steel Division official. Monthly capacity in operation and under construction was said to be approximately 1,300,000 tons. While output is only slightly more than 950,000 tons a month some of the capacity is being used to make high quality carbon steel.

PARISH

METAL STAMPINGS

★

MODERN DESIGN AT LOW COST

★

HOUSEHOLD APPLIANCES

New refrigerators, cabinets, bathtubs, stoves, and a wide range of other household necessities will be a joy to the post-war housewife.

Pressed Metal Parts and stampings will make possible unparalleled efficiency, smart beauty, long life,—all those qualities that lower sales resistance in a competitive world.

No other method provides *all* characteristics required,—resistance to elements, ability to take hard knocks in every day use, relative low cost, tensile strength, beauty and so forth. Parish Pressed Steel has completely rounded facilities; engineering cooperation in the drawing board stage, all sizes of presses for most efficient production, welding facilities, painting and finishing departments, and full assembly facilities.

It is not too early to plan your new designs. We are ready to work with you in the preliminary stages.

And as our contribution to post-war progress, we are now equipped to stamp, fabricate, and heat treat aluminum, in addition to steel.

ARMY E NAVY

PS

PARISH PRESSED STEEL CO., Reading, Pa.
Subsidiary of SPICER MANUFACTURING CORP.
Western Representative: F. Somers Peterson, 57 California St., San Francisco, Cal.

Mills and Grinders Shown in 23rd List Of Enemy Patents

• • • This is the 23rd list of seized enemy patents, available on license from the Alien Property Custodian. These patents are grouped in classes. Sub-class numbers are shown first in parentheses, followed by the patent number, description of the patent, the inventor's name and nationality, and the date of issuance.

This series began in the Nov. 4 issue of THE IRON AGE, page 95, at which time procedures for obtaining the patents for use were described with information concerning their usage and possibilities. Seized patent applications were shown in THE IRON AGE on July 8.

Class 83 — Mills

(3) 2,157,462. Grinding mill comprising coaxial toothed disks, in which the grinding teeth of a stationary disk intermesh with the grinding teeth of a movable disk, the teeth and the interdental spaces of the two disks being arranged in concentric rings about the common axis of the disks. B. Scherbaum, Germany. 5-9-39.

(6) 1,888,032. Device for emptying barrels which are arranged in a horizontal disposition. J. Fischer, Germany. 11-15-32.

(6) 2,236,939. Rotary cutter for machining smeary or sticky substances such as substances containing cellulose or cellulose derivatives. R. Etzkorn, Germany. 4-1-41.

(6) 2,306,857. Grinding disk for disk mills having opposite disks movable relatively to each other, with teeth arranged on said disks and the teeth being in circumferentially extending rows or rings each having the same height and the same width. K. Behnsen, Germany. 12-29-42.

(7) 1,790,967. Apparatus for preparing emulsions that will not naturally mix together such as oil or grease and water but which are capable of being converted into so-called emulsions or suspensoids. R. Auerbach, Germany. 2-3-31.

(7) 2,176,142. Cooling means for grinding mill disks. H. Merges and K. Behnsen, Germany. 10-17-39.

(7) 2,211,518. Grinding mill for the purpose of cooling disk-like grinding bodies, their grinding instrumentalities and the ground material. B. Scherbaum, Germany, 8-13-40.

(8) 1,653,472. Pulverizing or grinding mill having two pulverizing disks, the teeth of which mesh with one another and are preferably so formed that they serve partly for effecting the preliminary breaking up and partly for the fine grinding of the material which is fed centrally. B. Scherbaum, Germany. 12-20-27.

(8) 1,723,443. Disintegrating machine of the type having a biconical casing composed of or constituted by two hollow conical parts disposed with their bases or flaring ends opposite each other and adapted to be revolved in opposed directions. E. Roth, Germany. 8-6-29.

(8) 1,748,679. Disintegrating machine of the type having a biconical hollow casing composed of two conical shells disposed with their bases or flaring ends opposite each other and provided on their inner surfaces with a number of radial ribs. E. Roth, Germany. 2-25-30.

(8) 1,750,088. Grinding mill in which the end faces of several planetarily driven grinding disks cooperate with an annular grinding disk located within a casing. T. Bragard, Germany. 3-11-30.

(8) 2,218,876. Disk mill for the production of fine comminuted fibrous masses from vegetable or mineral substances comprising a support, a fixed annular disk non-rotatably mounted on said support and a rotatable annular disk mounted on said support coaxially with the fixed disk. J. Eirich and G. Eirich, Germany. 10-22-40.

(9) 1,636,138. Ball or tube mill for disintegrating any kind of material to be ground. W. Koppen, and C. Pfeiffer, Germany. 7-19-27.

(9) 1,646,532. Drum mill comprising a plurality of chambers arranged parallelly to each other in longitudinal direction within said drum, a plurality of chambers arranged at either end of said drum, and apertures between said former chambers and said latter chambers, whereby said chambers will all be connected in succession to each other. P. Goebels, Germany. 10-25-27.

(9) 1,650,508. Compound mill for the grind-

ing of substances and materials of all kinds, comprising in combination a rotary mill casing, cross partition walls subdividing the interior of said casing into a plurality of grinding spaces, and longitudinal walls subdividing said grinding spaces, except the first, into grinding chambers. P. Goebels, Germany. 11-22-27.

(9) 1,656,503. Grinding mill of the type in which within a grinding ring or mantle one or more round bodies roll and which differs from the known mills of this kind inasmuch as the generally fixed or unmovable grinding ring or mantle is adapted to oscillate transversally to the axis either in a straight or curved path at such a stroke and in such frequency that the rolling bodies are set to roll. J. Scherbaum, Germany. 1-17-28.

(9) 1,671,243. Rotary mill provided with a plurality of chambers and working with intermediate sifting. J. Ihlefeldt, Germany. 5-29-28.

(9) 1,671,291. Multichamber mill for grinding materials of all kinds. J. Ihlefeldt, Germany. 5-29-28.

(9) 1,700,667. Grinding body for tube and drum mills consisting of an outer member in the form of a helically wound spring with diametrically or approximately diametrically bent ends, and an interior member. A. Bues, Germany. 1-29-29.

(9) 1,719,971. Drum mill feeder consisting in combination with a drum mill, a feed hopper merging into a feeding chute for the material introduced into said feed hopper, an easily exchangeable lining in said feeding chute, said lining projecting far enough into said mill to prevent material from falling into the joint between the mill and feed hopper. K. Fahland, Germany. 7-9-29.

(9) 1,719,979. Crushing machine for hard materials consisting in combination of a ring roller mill with a grinding mill. J. Ihlefeldt, Germany. 7-9-29.

(9) 1,753,685. Discharge means for tube or ball mills. P. Bodenstein, Germany. 4-8-30.

(9) 1,864,542. Grinding body for use in mills and rotary drums of the type wherein vitrified or fused matter, or coarse substances, such, for instance, as clinkers, are broken up, ground and reduced to a pulverized or powdered state. K. Eberhardt, Germany. 6-28-32.

(9) 1,891,165. Roller mill for crushing materials of all kinds comprising in combination a housing, a non-elastic roll and an elastic roll rotatable in said housing and in operative contact with one another. P. v. Knupffer, Germany. 12-13-32.

(9) 1,932,741. Method of manufacturing disintegrated bronze foils. E. Kramer, Germany. 10-31-33.

(9) 1,992,742. Ball-mill for grinding lac-

AERIAL INCENDIARIES: These incendiary bombs weigh 2 to 4 lb. each, and are released in clusters to fall individually. A bomber can carry as many as 1500. The operator here is corking the vent holes of the bombs.

Do You Need the 43rd?

Arcos produces stainless steel and alloy electrodes exclusively. At present we have 42 different grades ... each one engineered to do a thoroughly dependable job of welding ... each one a proved answer to a specific welding need.

In developing these 42 grades of stainless and alloy electrodes, Arcos has obtained a wealth of specialized knowledge which will expedite for you the creation of the 43rd or 44th, if our present list does not meet your specific need. The Arcos Research and Engineering Department welcomes your inquiries.

Send for the new Arcos Electrode Analysis and Color Chart.

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401 NORTH BROAD ST., PHILADELPHIA, PA.

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Boston, Mass. (Belmont), H. Boker & Co., Inc., W. E. Fluke
Buffalo, N. Y. ..... Root, Neal & Co.
Chicago, Ill. ..... Machinery & Welder Corp.
Cincinnati, Ohio ..... Williams & Co., Inc.
Cleveland, Ohio ..... Williams & Co., Inc.
Columbus, Ohio ..... Williams & Co., Inc.
Detroit, Michigan .... C. E. Philips & Co., Inc.
Erie, Penna. ..... Boyd Welding Co.
Fresno, Calif. ..... Victor Equipment Co.
Ft. Wayne, Ind. .. Wayne Welding Sup. Co., Inc.
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Houston, Texas .. Champion Rivet Co. of Texas
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Kingsport, Tenn. ..... Slip-Not Belting Corp.
Los Angeles, Calif. ..... Victor Equipment Co.
Milwaukee, Wis. .... Machinery & Welder Corp.
Moline, Ill. ..... Machinery & Welder Corp.
Montreal, Canada . G. D. Peters & Co. of Canada, Ltd.
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New York, N. Y. ..... H. Boker & Co., Inc.
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Pampa, Texas ..... Hart Industrial Supply Co.
Pittsburgh, Pa. ..... Williams & Co., Inc.
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Rochester, N. Y. ..... Welding Supply Co.
San Diego, Calif. ..... Victor Equipment Co.
San Francisco, Calif. ..... Victor Equipment Co.
Seattle, Wash. ..... J. E. Haseltine & Co.
St. Louis, Mo. ..... Machinery & Welder Corp.
Syracuse, N. Y. ..... Welding Supply Co.
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"QUALITY WELD METAL EASILY DEPOSITED"

quers, chiefly of cellulose-ester lacquers, having a drum of acid-resistant and non-oxidizing steel rolled to spring hardness and of a very small thickness, a wooden shell, surrounding and supported by the drum, a cover of acid-resistant steel and a valve of the same material. A. Dreyer, Germany. 2-26-35.

(9) 2,013,179. Grinding mill of the rotary drum and ball type for finely comminuting and pulverizing solid materials in bulk, primarily hard substanaces such as minerals of different description including ore, coal, coke, etc., also metallurgical, chemical and ceramic products, cement clinker and the like. E. Gerasch, Germany. 9-3-35.

(9) 2,031,710. Pulverizing apparatus for the purpose of introducing into and discharging currents of gas from tube and compound mills. J. Ihlefeldt, Germany. 2-25-36.

(9) 2,060,375. Production of powdered oxidized lead powder in an extremely dry state. L. Ishimura, Japan. 11-10-36.

(9) 2,117,965. Grinding device for subdividing dry substances, suspensions, pastes and the like by means of quartz sand or similar hard, fine-grained grinding elements. S. Kiesskalt and W. Mejer, Germany. 5-17-38.

(9) 2,130,744. Rotary drum for grinding and similar operations, more particularly to such drums of uniform circumferential shape provided with longitudinal partition walls arranged in star fashion whereby the drum is divided into a number of chambers surrounding the axis of rotation. W. Reintrock, Germany. 9-20-38.

(9) 2,170,768. Grinding and the like apparatus for comminuting materials. G. Heinrich, Germany. 8-22-39.

(9) 2,191,115. Grinding device comprising a container for the reception of the material to be ground, the said container having a substantially arcuate wall for supporting the mixture of said substances and grinding elements. S. Kiesskalt and W. Mejer, Germany. 8-29-39.

(9) 2,208,077. Grinding mill for continuously grinding material in bulk, of the gyrating type having a plurality of material receiving containers which are bodily gyrated at high frequency. G. Linke, Germany. 7-16-40.

(9) 2,241,848. Apparatus for preparing very fine lustrous metal particles as are required for making bronze paints and metal powder. J. Eckart, Germany. 5-13-41.

(9) 2,292,275. Crushing mill for crushing dry or moist material comprising a receptacle, a body mounted therein for oscillation relative to said receptacle, radially extending oscillation transmitting members on said body, crushing elements within said receptacle and in contact with said body. S. Kiesskalt, Germany. 8-4-42.

(9) 2,315,229. Apparatus for the comminution of granular and pulverulent dry substances or pastes and the like materials, comprising a structure providing a grinding chamber, elastic means for mounting the structure and permitting the grinding chamber to assume a vibratory oscillating movement. G. Schieferstein, Germany. 3-30-43.

(10) 1,656,895. Conical crushing mill comprising a conical crushing mantle, a shaft and a seating element fixed to the shaft, a mass of hard lead or the like material filling up the intermediate space between the crushing mantle and the seating element, steps on the seating element, one or more of the steps of the seating element behind under-cut. H. Ackermann and W. Langenheim, Germany. 1-24-28.

(10) 1,694,524. Apparatus for kneading and forming amalgams comprising an upper section and a lower section connected for independent rotation and provided with alining longitudinal bores and a piston fitted in the bore of the upper section and having a stem in threaded engagement with the bore of the lower section. K. Zentner, Germany. 12-11-28.

(10) 2,161,096. Conical-type stone crusher comprising a crushing mass, consisting of the interior cone and the attached outer casing, and a second mass forming the crushing shell, resilient means being provided between said two masses, said two-mass system being caused to describe circular oscillations, with a phase displacement of 180 deg., through a loose coupling, whereby a crushing action is produced. G. Schieferstein, Germany. 6-6-39.

(10) 2,171,429. Gyratory crusher which may freely oscillate in the interior of a crusher bowl. S. Kiesskalt, Germany. 8-29-39.

(11) 1,647,183. Disintegrating mill of the type in which one or more rotary beaters cooperate with a grate in the form of a funnel, the said beaters passing between the grate bars and acting on the material placed thereon by impact. A. Leggemann, Germany. 11-1-27.

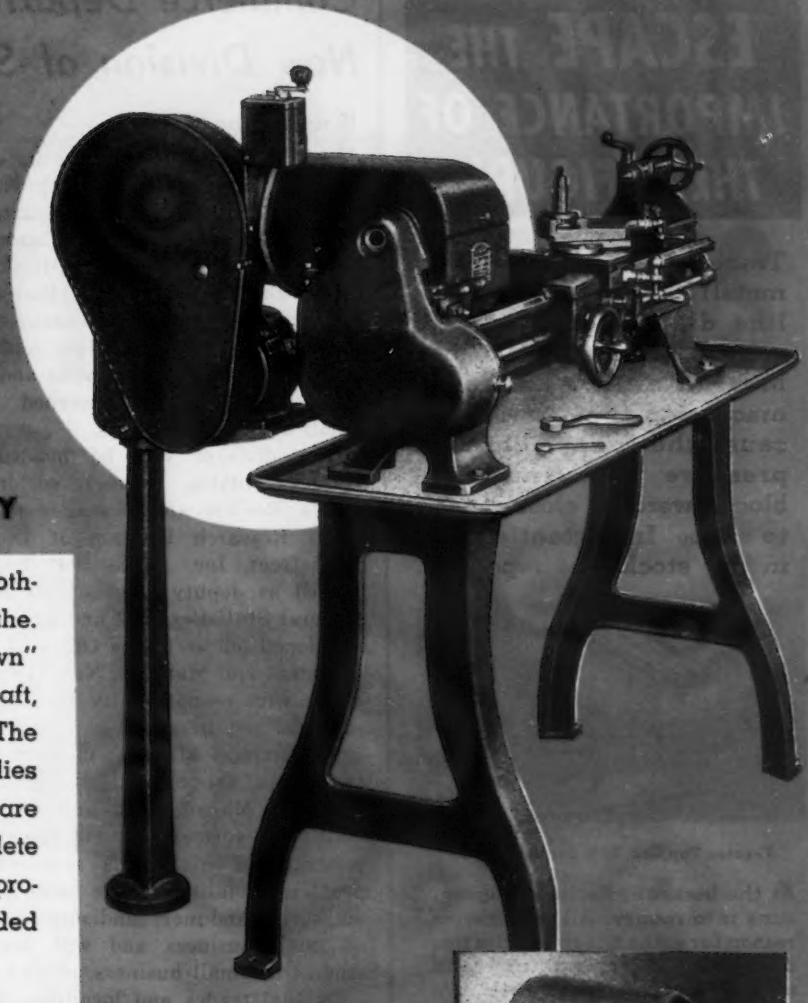
(11) 1,671,678. Eddy or whirling mill for pulverizing hard materials wherein the small pulverizing particles are caused to repeatedly impinge upon one another by two or more mutually impinging whirling currents that are prevented from evading each other. H. Kramer and E. Podszus, Germany. 5-29-28.

(11) 1,685,956. Whirling mill for the production of finely-divided powder based on the principle of causing comminution by the frequently repeated mutual impingement at a very high rate of speed of the various particles of the material under treatment. E. Podszus, Germany. 10-2-28.

(CONTINUED IN NEXT ISSUE)

AISE CRANE COMMITTEE: *The Association of Iron and Steel Engineers' Crane Committee is investigating the desirability of cold driven rivets in the construction of laminated ladle hooks. Cold driving with correct pressures is reported to give a tight joint and increase rivet strength. This Osborne riveter controls pressures automatically.*

Enclosed Design



- PROTECTS LATHE OPERATOR
- KEEPS VITAL PARTS CLEAN
- MAKES BELT CHANGING EASY

The operator does not catch fingers or clothing in moving belts or gears on a Logan Lathe. The Cone Pulley Guard in its normal "down" position completely covers the countershaft, headstock and back gear assemblies. The motor-drive belt and change gear assemblies are completely enclosed. All guards are quickly and easily opened giving complete accessibility. Not only is the operator protected, but vital parts of the lathe are shielded from dust and dirt accumulations.

Raised to its "up" position, the Cone Pulley Guard automatically moves the countershaft toward the headstock, releases flat belt tension, and makes changing the belt position easy and safe...an exclusive, patented Logan feature. The flat belt tension is easily and quickly regulated by a simple screw adjustment. Full information on all the advanced design features of all models of Logan Lathes will gladly be sent you on request. Write today for your copy of the latest Logan Lathe catalogs.

OPERATOR PROTECTED . . .
VITAL PARTS KEPT CLEAN

Countershaft, back gears, headstock, change gears and motor-drive belt are all completely enclosed, yet quickly accessible.

BELT CHANGES EASY AND SAFE

Raising the Cone Pulley Guard to "Up" position automatically moves the countershaft toward the headstock, releasing tension on the flat belt.

BRIEF SPECIFICATIONS

Swing over bed, 10½" . . . bed length, 43⅛" . . . spindle hole, $2\frac{5}{32}$" . . . capacity, ⅝" with push type collet . . . 6-position automatic indexing turret . . . stroke of turret, 4¼" . . . 12 spindle speeds from 30 to 1450 r.p.m. . . . all moving parts protected by ball bearings or self lubricating bronze bearings.

No. 850
MANUFACTURING
TURRET LATHE

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CHICAGO 30, ILLINOIS

"One of a series describing the finer features of Logan Lathes . . . Look for the next of the series

Commerce Department Creates New Division of Small Business

Washington

• • • **Set up to** coordinate its small business activities and work closely with field offices of the Department of Commerce, Secretary of Commerce Jesse Jones has created a Division of Small Business within the Bureau of Foreign and Domestic Commerce. The Division will maintain close relations with all government agencies and private organizations concerned with small business problems.

The division will be headed by Quincy Adams, former editor of Dun's Review and manager of the Sales Research Division of Dun & Bradstreet, Inc. Since 1940 he has served as deputy chief of the WPB General Statistics staff and as a commissioned officer in the Office of Procurement and Material, Navy Department, with responsibility for date of material requirements.

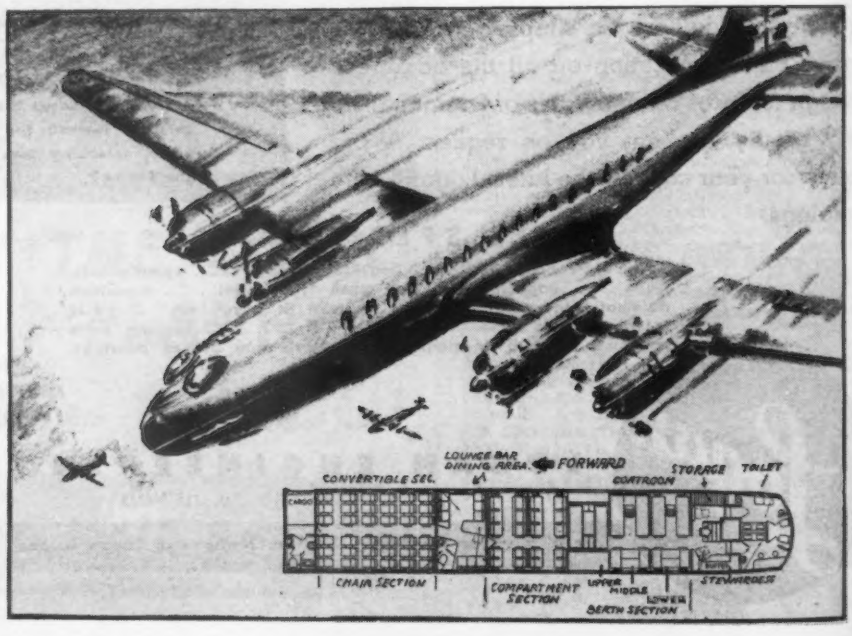
The division will start its work with two units, the Special Studies Unit and the Management and Finance Unit. The former unit will conduct a program of continuous research in problems relating to the competitive marketing and merchandising position of small business and will develop studies of small business problems of individual trades and localities. This unit will maintain close relationships with the collegiate schools of business. Chief of this unit will be Wilford L. White, a marketing specialist of long experience, who has served continuously with the Bureau of Foreign and Domestic Commerce since 1934.

The Management and Finance Unit will be concerned principally with the development of management aid for small business. It will also conduct studies in the vital fields of credit, taxation and finance.

No Easing of Steel for Containers Expected

• • • **Packers and** shippers who use tin cans, steel drums, pails, and metal closures cannot expect improvement in the availability of those supplies during the next six months, Edward J. Detgen, director of the Containers Division of WPB, said. There is no thought of relaxing in the near future any of the metal containers limitation orders affecting tin cans, steel drums, pails and metal closures. In general the type of steel used for these containers is the same as that required by several of the most urgent military programs. As rolling mills are now working at capacity, and no drop in military requirements is in sight, no steel for containers can be anticipated in the near future.

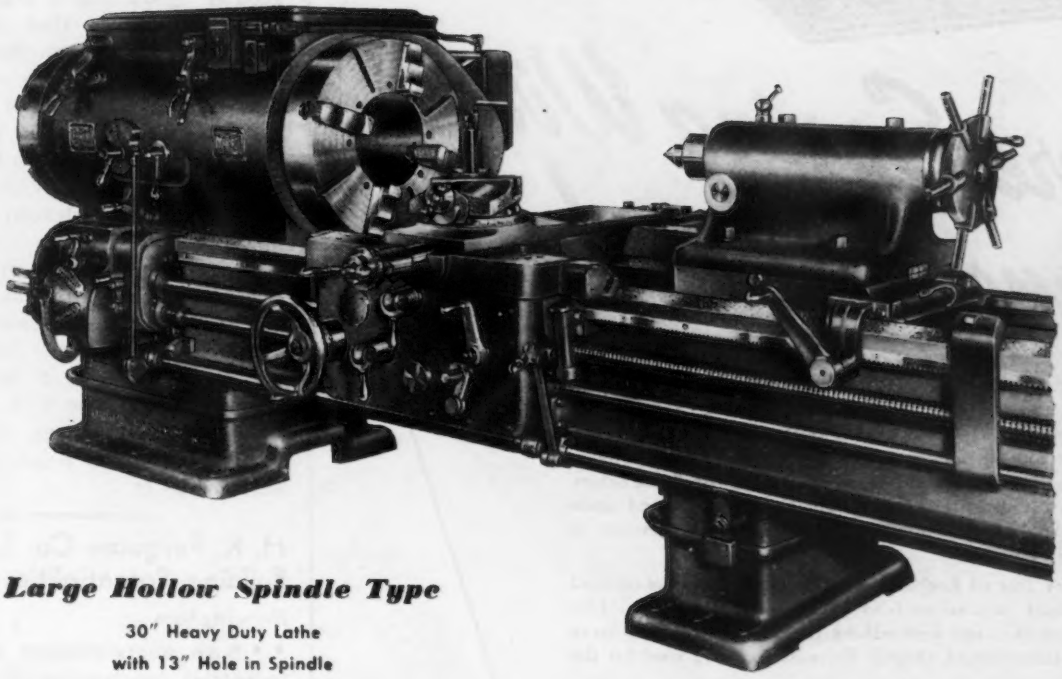
DOUGLAS DC-7: *This is the new 72-ton commercial airliner that Douglas Aircraft Co. will use in its bid for trans-oceanic passenger and cargo service after the war. Its luxurious accommodations will provide for 86 passengers as a day plane and 76 as a sleeper.*



Streamline

YOUR PRODUCTION WITH

HYDRATROL LATHES



Large Hollow Spindle Type

30" Heavy Duty Lathe
with 13" Hole in Spindle

PLANTS EVERYWHERE REPORT...

- ✓ ***Production Increased***
- ✓ ***Product Improved***
- ✓ ***Man-Power and Materials Saved!***

18" Lathe with 7 1/8" Hole in Spindle

FIVE SIZES PROVIDE WIDE RANGE OF USEFULLNESS AND EFFICIENCY!

Small, 18" up to 7 1/4" Hole Large, 27" up to 13" Hole
Medium, 24" up to 12" Hole Large, 30" up to 14" Hole
Large, 36" up to 16 1/2" Hole
(Standard type lathes, 16" to 36")

Lehmann MACHINE COMPANY

CHOUTEAU AT GRAND ★ SAINT LOUIS (3) MISSOURI

Baltimore Yard Aims At 42 Ships for 1944

• • • **The Bethlehem-Fairfield** shipyard at Baltimore, which has delivered more than 300 Liberty ships since its founding three years ago, hopes to build 42 Victory ships this year, according to J. M. Willis, vice-president and general manager of the yard. It is planning to lay its first Victory ship keel early next month. The yard holds a contract for the construction of 53 Victory ships.

The Victory ship will have a greater speed and a slightly larger carrying capacity than the Liberty. Featuring a three-cylinder, triple-expansion, reciprocating engine, the Liberty has a rated speed of 11 knots and develops 2500 hp. The Victory ship plans call for steam turbines designed to drive the vessel at more than 15 knots and develop about 6000 hp.

In size there is little difference between the two types. The Liberty, or the EC2, is of 10,920 deadweight tons, 441 ft. 8 in. in overall length, 57 ft. beam, and loaded draft of 27 ft. 9 in. The Victory, or the VC2, is rated at 10,800 deadweight tons, 455 ft. overall length, 62 ft. beam, and loaded draft of 28 ft.

H. K. Ferguson Co. Surveys Building Potentialities of South

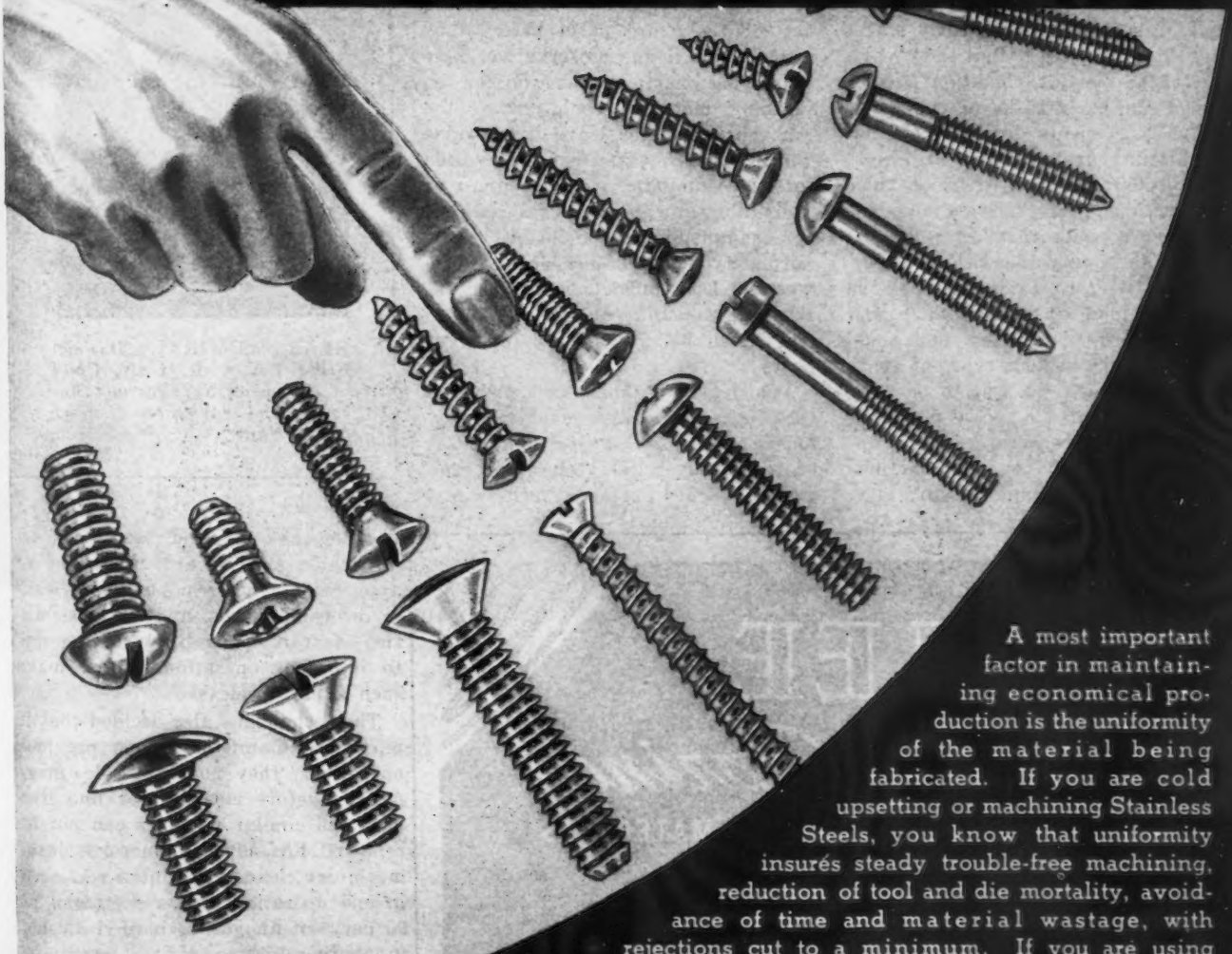
Birmingham

• • • **An unprecedented** program of industrial construction in the South awaits only the release of materials, according to a market survey announced by the H. K. Ferguson Co., industrial engineers and builders, Cleveland. The survey was conducted by C. W. Roberts, manager of the company's southern district office in Birmingham. It is based on answers to a questionnaire circulated to several hundred leading southern industrialists and scores of field contacts in every southern state.

Tabulations of returned questionnaires indicate that total volume of industrial building will be distributed as follows: 75 per cent for expansion of present facilities and for space in which to manufacture entirely new products; 15 per cent for reconversion of existing facilities to peacetime production; and 10 per cent for "maintenance" construction and repairs.

The relatively low percentages of money to be spent for reconversion work is attributed to the fact that few plants in the South were converted from their regular peacetime pursuits.

NEED ANY HELP *Securing* UNIFORM STAINLESS?



A most important factor in maintaining economical production is the uniformity of the material being fabricated. If you are cold upsetting or machining Stainless Steels, you know that uniformity insures steady trouble-free machining, reduction of tool and die mortality, avoidance of time and material wastage, with rejections cut to a minimum. If you are using Rustless Stainless Steel bars and wire, you know that its uniform high quality, its lot to lot, heat to heat homogeneity pays production dividends.

Rustless service goes beyond the delivery of uniform Stainless Steel. Our service men have helped solve problems in many shops, and our laboratory has studied cutting rates, tooling, lubricants and special finishes. This specialized knowledge is at your disposal. If you have a specific problem, call our nearest District Office.

Rustless

WHEN YOU WANT TO KNOW MORE ABOUT STAINLESS *Ask* RUSTLESS

RUSTLESS

Producing STAINLESS STEEL *Exclusively*

RUSTLESS IRON AND STEEL CORPORATION, BALTIMORE 13, MD.

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Navy Wages War Against Corrosion

(*Continued from page* 122)

is being done by the Navy at several depots in the United States.

Prior to and since the war, complaints, particularly from the Pacific areas, were received that vital spare parts for planes, tanks, ships, trucks, bulldozers and other units for the Navy were arriving with a large percentage rusted or in the early stages of rust. To see to it that these parts arrived in perfect condition became one of the early tasks of the Navy.

The experiments generally consisted of taking steel cylinders with highly polished surfaces, treating them with various preservative compounds and then placing them in a cabinet under a salt spray and with a temperature of 100 deg. By this method the technicians quickly learned which compounds were satisfactory and could be used on the various types of spare parts. The next job was to package and wrap the article so the preservative would not be scratched or damaged to allow a speck of rust formation to gain a hold and spread.

Navy technicians conferred with private industry. As a result of various tests a satisfactory wrapping material was made available. The wrapper is grease-proof, acid-proof and may be made waterproof by dipping in a sealing compound.

The first step involved the cleaning of the spare parts before they were dipped in the preservative. One of the big questions was whether the cleaning material would attack the part chemically or leave irremovable residues which would cause corrosion later. Aluminum, magnesium, or their alloys, or zinc base die castings, for example, cannot be cleaned in the normal type of alkaline cleaner. This was the least difficult job of the entire program. Different cleaning material must be utilized for different parts.

The degree of finish or polish and the degree of dimensional accuracy must be definitely considered. In cases of extremely close tolerances and highly polished surfaces, such as fine ball bearings, alkaline cleaning is not applicable since the temperature of application, trace residues from cleaner or water rinses, and the possibilities of staining or light rusting due to improper operation, might make such a part useless.

REAR ADMIRAL *William Brent Young, SC USN, Chief of Bureau of Supplies and Accounts and Paymaster General of the Navy.*

The technicians also decided that if parts are magnetic due to previous operations, they should be de-magnetized before cleaning, or fine iron dust and similar particles can not be removed. For solvent immersion cleaning, a dry cleaner's naphtha was used in one operation, and a methanol of 99 per cent anhydrous methyl alcohol in another.

For alkaline immersion cleaning there are two fluids used on metals not attacked by high alkalies. One consists of 85 per cent sodium orthosilicate, 10 per cent sodium carbonate, anhydrous and 5 per cent sodium resinate. The other is 46 per cent sodium carbonate, anhydrous, 32 per cent trisodium phosphate, 16 per cent hydroxide and 6 per cent rosin.

In addition to the general immersion method of cleaning spare parts, there also were the alkaline spray method and the alkaline electro-cleaning method. The latter is the alternate procedure for cleaning parts that can be satisfactorily cleaned by the immersion method. After the cleaning of the spare parts there is

(CONTINUED ON PAGE 164)

and HERE'S WHAT HAPPENS *Automatically* -

- **Clutch Housing Bored and Faced**
- **Center Main Bearing Milled on Both Sides**

THIS CROSS SPECIAL MACHINE, by means of three independent but simultaneous feeding motions, straddle mills the center main bearing of an automotive cylinder block, and bores and faces the clutch housing—at the rate of 30 pieces per hour at 80% efficiency.

More than that, this machine enables inexperienced or unskilled operators to maintain close tolerances. The work cycle is fully automatic and functions without attention. Labor costs per piece are low. Large-volume production is obtained from a small floor area. Cutter breakage and scrap losses are minimized by means of interlocking electric controls.

Milling, facing and boring are thus combined into one fully automatic operation on a Cross *Special Machine* that *anyone can operate.*

The idea behind the design of this machine is the idea behind all Cross *Special Machines*... removal of metal at lower cost on equipment that operates at the push of a button. It is a principle that can be applied to any type of machining operation, a principle that is in successful use all over the world.

Cross Engineers are available to survey your present machining methods and, if special machines can lower your costs or help solve your manpower difficulties, they will design, build and install the machines for you, and show your workmen how to operate them.

The new Cross Catalog contains 38 detailed case histories of successful Cross *Special Machines.* For your copy, write on your letterhead to The Cross Company, Detroit 7, Michigan, Department 22.

Special Machines •

for automatically performing any one or a combination of metal cutting operations

TURNING · MILLING · DRILLING · BORING · REAMING · TAPPING · GRINDING

(CONTINUED FROM PAGE 160)

the important procedure of drying them. Blowing with compressed air and drying in an oven are the two acceptable procedures. Wiping with a cloth is used when either of the other two is impractical.

In oven drying adequate quantities of fresh air are delivered to the oven in order to expel the solvent vapors as fast as the solvents evaporate. Oven temperature is between 250 and 450 deg. F. except when lower temperatures are necessary due to low melting solders or organic materials present on the parts. Lower oven temperatures also are used when oven drying is merely for the purpose of speeding up the evaporation of petroleum solvents or methanol. In applying the preservatives there are four processes: dipping, spraying, brushing and flow-coating. These are in the order of importance.

Special preservatives compounded specifically for preventing corrosion, and consisting usually of surface active materials or inhibited oils, are used for most of the operations. The degree of finish and the tolerances are the two main points to be considered in deciding the kind of preservative to be applied.

FOR SHIPMENT OVERSEAS: *General view of wrapping tables and conveyor lines. The women are wrapping parts of a limited size.*

There are three general types of compounds. One is a light oil with an added corrosion inhibitor. This is applied to parts that will be pressed into service immediately and where the compound is not removed. Guns and gun parts are good examples. The second is a heavy grease with an added inhibitor, used on parts as both a lubricant and corrosion preventive. The third is a thin, film "polar type" compound that sets up to a tacky surface after application. It is used on parts with fine tolerances and must be cleaned off when the part reaches its destination and is pressed into service. Usually preservatives will not be applied to non-metallic parts such as those of cork, paper or fabric, unless they are treated to prevent mold growth.

Whenever the preservative must also function as a lubricant or lubricating oil, then such considerations must be first and the corrosion preservative requirements second, provided, however, that only relatively mild corrosion conditions are to be encountered. Whenever severe corrosion conditions are encountered, the preservative rather than the lubricating requirement must be met.

What does all of this mean?

It means that different parts must be cleaned and dried differently and that different parts receive different kinds of preservative. It means that the technicians were first faced with a rather bewildering array of difficulties, each to be met and conquered separately. It means that corrosion pre-

WITH almost every aluminum and magnesium alloy casting we make going into one war job or another, Permite Castings have to be good—and they are.

Rigid inspection guards Permite quality at every step of production. Standardization of technique and thorough laboratory control, supported by X-ray inspection and spectographic analysis, contribute further to the uniformly high quality of the Permite Castings that go into today's super fighting machines.

War requirements today take most of our production. But when the war is won, Permite advanced technique in making aluminum and magnesium alloy castings of superior quality will be fully available for the better products of a better world.

Recommendations and estimates submitted upon request to war production manufacturers. We also welcome the opportunity to work with engineers on their postwar designs.

ALUMINUM INDUSTRIES, Inc., Cincinnati, Ohio

Detroit: 809 New Center Bldg. Los Angeles: 324 N. San Pedro St. Chicago: 616 S. Michigan Ave.

PERMITE ALUMINUM AND MAGNESIUM ALLOY CASTINGS

ventive materials could not be chosen simply because they were easy to apply. It means that all surfaces of the parts had to be coated uniformly and this required various procedures for different parts.

The method of packaging also was of great importance. No matter how well-coated a part might be, if the wrapper is punctured and air rushes in, there always is a possibility that corrosion eventually will get to the part's surface at some of the spots where the preservative coating is damaged.

In addition to wrapping in the grease-proof and acid-proof material, there is another method used known as the "Sealed Wrap with Dessicant" method. The moisture vapor barrier is used for wrapping and a dessicant, silica jel, is placed inside and the package sealed. The dessicant absorbs the moisture inside and any that seeps through the walls of the package.

Characteristic of corrosion prevention work is that done at the Central Spare Parts Warehouse at Joliet, Ill. The corrosion prevention plant was designed by the Bureau of Supplies and Accounts but is operated by the Bureau of Yards and Docks. To this depot all of the spare parts for equipment and vehicles of the Seabees is sent by the manufacturers from all parts of the country. This includes parts for trucks, jeeps, peeps, graders, cranes, bulldozers, etc.

HEAVY PARTS PROTECTION: *This is a general view of the large cleaning and dipping machines and the dipping tanks for heavy spare parts at the corrosion prevention plant at Joliet. The larger parts are cleaned, rinsed, dried and finally dipped in a preservative—all by this machinery.*

The building where this work is carried on contains automatic cleaning and preserving equipment, the other with a long series of wrapping tables and belt conveyors where the articles are dipped with the preservatives and packaged. Parts tagged for treatment flow into one end of the long building. There they are placed in baskets on an overhead conveyor that moves them through a large washing machine and then through a good rinse.

From there they pass into the drying oven with both fans and heat that thoroughly dry the parts. Then the conveyor dips them into the preservative compound, allows the excess compound to drain and again the oven dries the remaining compound. This drying is at a low temperature—approximately 95 deg. F. The baskets of parts are then removed from the conveyor and placed on tables to be wrapped and packaged. In some cases the wrapped packages are dipped in wax sealing compound to insure their being air-tight, and then they are treated to prevent sticking together which facilitates handling in high tropical temperatures.

At the Joliet plant about 300 civilians are employed at the protective packing and processing plant. Approximately 15 tons of parts every 8-hr. shift are processed. Everything from a cotter pin and ball bearing to a crank shaft and cylinder block are handled. Admiral Young and other

WHAT MAKES A BOMB OR SHELL EXPLODE —AT THE RIGHT INSTANT?

When a bomb or shell explodes is just as important as *where.* Some are designed to explode before contact with the target, and some on contact. This "intelligence" depends upon a little precision device called a fuze. If for any reason the fuze doesn't function with split second timing, the shell or bomb has either been a failure or accomplishes greatly lessened destruction.

It is because of the unfailing accuracy of this device that the number of "duds" dropped by our flyers and fired by our gunners is practically negligible.

Pollak has made over 20 million fuzes for the Army and the Navy. So well have we done our job that the Pollak Manufacturing Company has been awarded the Army-Navy "E" and four stars.

Our big job now is to continue to turn out this and other vital war equipment for the Armed Services, but when peace is declared we will again develop and produce parts and complete products for other manufacturers and sales organizations. Even now, you are probably planning for peacetime manufacture, so we suggest that you consider Pollak and its large, modern equipped plant manned with over 4,000 well trained workers to help you with your product development and manufacturing job. Call us in to your peacetime manufacturing conference now. Our executives and engineers have much to offer in valuable experience and knowledge that can be helpful to you. We will be glad to meet with you at your convenience.

POLLAK PRECISION PRODUCTS

Five Army-Navy "E" awards—the Flag and Four Stars—each of which symbolizes six months of Exacting Service to our Armed Forces, have been awarded to Pollak.

POLLAK MANUFACTURING COMPANY · ARLINGTON, NEW JERSEY

DEVELOPING · DESIGNING · FABRICATING · STAMPING · SPINNING · WELDING · FINISHING · MACHINE WORK

Navy officers regard these corrosion prevention installations as among the best investments the Navy ever made. The protective packing plant at Joliet, for example, will have an annual operation cost of under $500,000. Operating costs at other depots were much lower. Since the estimated annual savings are in excess of $10,000,000, as Admiral Young says, it is not difficult to see how they are a "paying" proposition.

Prior to the establishment of these depots the loss due to corrosion was high, especially in the South Pacific. Various estimates were made, as high as 30 per cent. Exposed parts rusted within a few hours. A spare part with a high tolerance began rusting almost immediately from a rust speck or even a fingerprint. The tropical humidity was one of the worst enemies. In the early stages of the battles of the Pacific, parts were landed haphazardly on the beaches where they rusted within a few days. Rust in the South Pacific is an implacable enemy that never retreats. Once it starts there is no way to arrest it without damaging the spare parts to the extent that it is useless. It is the "cancer" of this spare parts war. It is insidious. Its beginning is minute and seldom observed. Once started, its growth is rapid.

There are numerous other factors that cause rust. They are residual soldering or brazing fluxes, cutting or cooling compounds, buffing or grinding compounds, metallic residues from machining, grinding, lapping, etc.; residual heat treat salts, general factory contamination from boxes, machines, floor, dust and chemical deposits in corrosive atmospheres, and residues from marking inks or etching solutions.

Gloves are worn by the workers when handling the more critical parts. The workers are taught the value of sending a perfect machine part across the seas to the theaters of war. They are taught to realize that one fingerprint might turn a tide of battle, that this is a spare parts war, and that the success of an offensive may depend upon the men getting sufficient supplies, which means, too, sufficient replacements for these supplies.

Nothing can be more discouraging than for a South Pacific squadron, grounded maybe for days because of a lack of spare parts, to find that the newly arrived parts are corroded and unfit for use.

War is man's most wasteful folly. It is wasteful enough to manufacture a machine of war and dissipate its tangible value against the enemy, but it is far worse to make a spare part and send it right up to the battle front only to find it cannot be used.

That is why the Navy worked so hard to conquer rust and corrosion. Thousands of spare parts for almost every machine of war used by the Navy, Coast Guard and Marine Corps now are being given the corrosion preventive treatment. They are almost all getting to the war theaters in perfect condition. The corrosion loss has been greatly reduced.

Cylinder bases, spark plugs, oil pumps, exhaust pipes, fuel tanks, fuel strainers, manifolds, cylinder heads, pistons, rings, propeller shafts, silencer elements, sprockets, distributors, carburetors, valves, transmission housings, timing gears, gear assemblies, generators, electric motors, engine mountings — these and thousands of other parts now arrive at the war fronts in usable condition.

The Navy's victory over corrosion undoubtedly will not be lost in the postwar period. The rapid expansion of communication and transportation lines after the war, the development of new lands, the increase in trade, the tremendous expansion in travel, and various other factors will combine to utilize the lessons learned in corrosion prevention.

Various chemical companies now are conducting experiments with new methods of preservation. They will be ready at the end of the war to put them on the market.

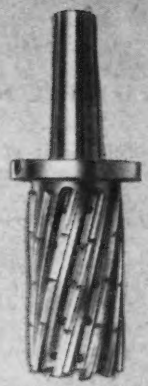
Thus, the Navy's fight against corrosion will have had a two-fold result. First, it is aiding the successful prosecution of the war. Second, it will point the way to a postwar program where greater utilization of metal and vital parts for mechanized machines of peace will be realized.

Oh What Rubbish!

Buffalo

• • • A one-inch capsule of radium sulphate valued at $15,000 was found March 27 in a rubbish pile at the Bison Casting Co. It was located by a detection device after it had been missing from the company vault since March 25.

R Q FACE MILL



HELICAL SLAB AND END MILL

SLOTTING

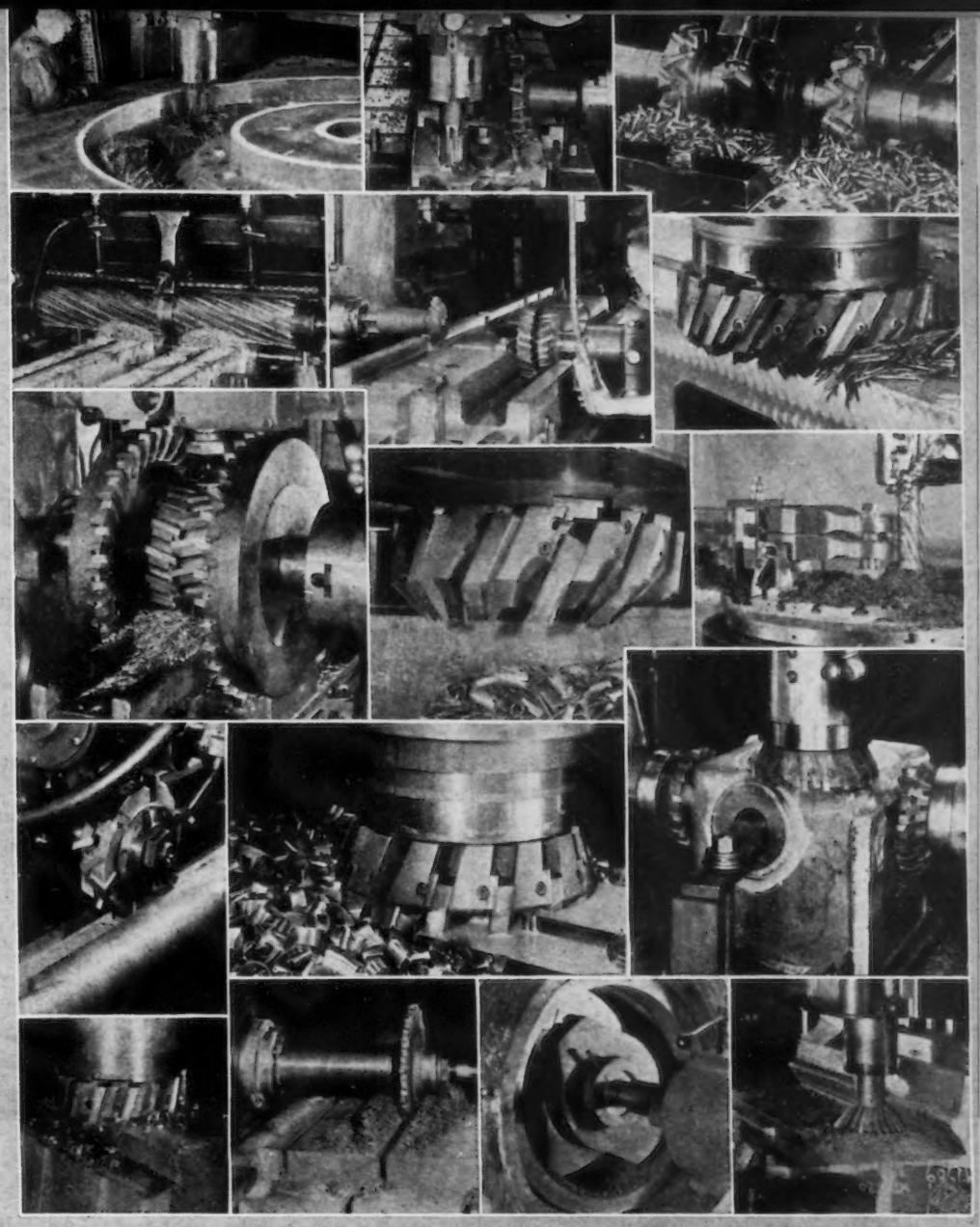
SIDE MILL

HIGH SPEED SHEAR CLEAR

TYPE N. B. FACE MILL

STAGGERED TOOTH CHANNELING

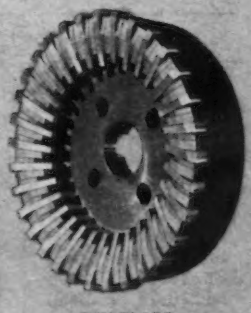
SPECIAL CARBIDE TIPPED



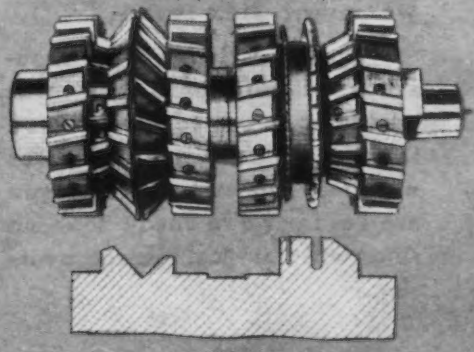
TYPE N X FACE MILL

SHEAR CLEAR FACE MILL

N X SOLID SHANK END MILL



RAY BLADE FACE MILL



CUTTER GANG

Present Ingersoll cutter designs have developed from over fifty years' experience in making tools for special Ingersoll milling, boring, and drilling machines. In addition to the standard types of inserted blade milling cutters for face milling, side milling, slotting slabbing and end milling, many special types of tools are available. Both types are illustrated above by themselves and at work.

Most of these tools may be furnished with either high speed steel, cast alloy, or carbide tipped blades. We also build solid cutters with brazed carbide tips and negative angle carbide cutters for milling steel.

We will be glad to send you a booklet (Ingersoll Milling Cutter Engineering Specification Sheets) describing our standard inserted blade cutters. Your inquiries concerning special inserted blade tools will also receive prompt attention.

THE INGERSOLL MILLING MACHINE CO., ROCKFORD, ILL.

Hot Workability Test for Metals

(*Continued from page 89*)

pierced and rolled without difficulty.

The hot workability test described has been used for determining the best conditions for piercing solid rounds to make seamless tubing. This type of hot working is one of the most rigorous. A 48-in. length of solid round is converted into a rough heavy wall tube in about 5 sec. in the piercer. Steels which forge and roll without great difficulty often cannot be pierced commercially.

Discussion of Results

While no test data have been correlated with other hot working operations such as forging, it is believed that similar results would be obtained. The twist test would indicate the best forging temperatures and which heats could be deformed the most.

Since this paper was written, Clark (THE IRON AGE, *March 16, 1944*) *has used the author's method for determining the maximum forging temperatures for four different steels. From these tests he concludes that a maximum forging temperature can be specified for each type of steel.*

It is believed that this conclusion is based on too few tests. Heats of the same type steel that have been tested in Globe Steel Tubes Co. laboratories have differences of as much as 150 deg. F. in their maximum twists. In Table II if heat E was hot worked at 2200 deg. F. as recommended by Clark from data on heat D of the same type, this temperature would be 100 deg. F. too high as determined by the actual tests on heat E. Therefore, it is not possible to generalize on the hot working properties of any type of steel from a few tests.

Different test speeds have been tried. In general, the shape of the curves are similar for the same steel at different speeds. At lower speeds, less turns are required to break the bar and the accuracy of the reproduction of the results is less.

Larger and smaller size bars than the 9/16 in. standard have been tried. No advantage was found in the use of bars smaller than this size, and larger bars required more metal and more power to twist them. Machined sections in the center of the bars cause inaccuracies because the twists are not confined to the small section and the twists in the center section tend to pile up at the shoulders.

Torque and tensile tests at high temperatures did not differentiate between heats that showed marked differences in twist tests and mill results.

An elevated temperature, high speed torsion test has been described for testing the hot workability of steels. Small bars of steel are twisted to

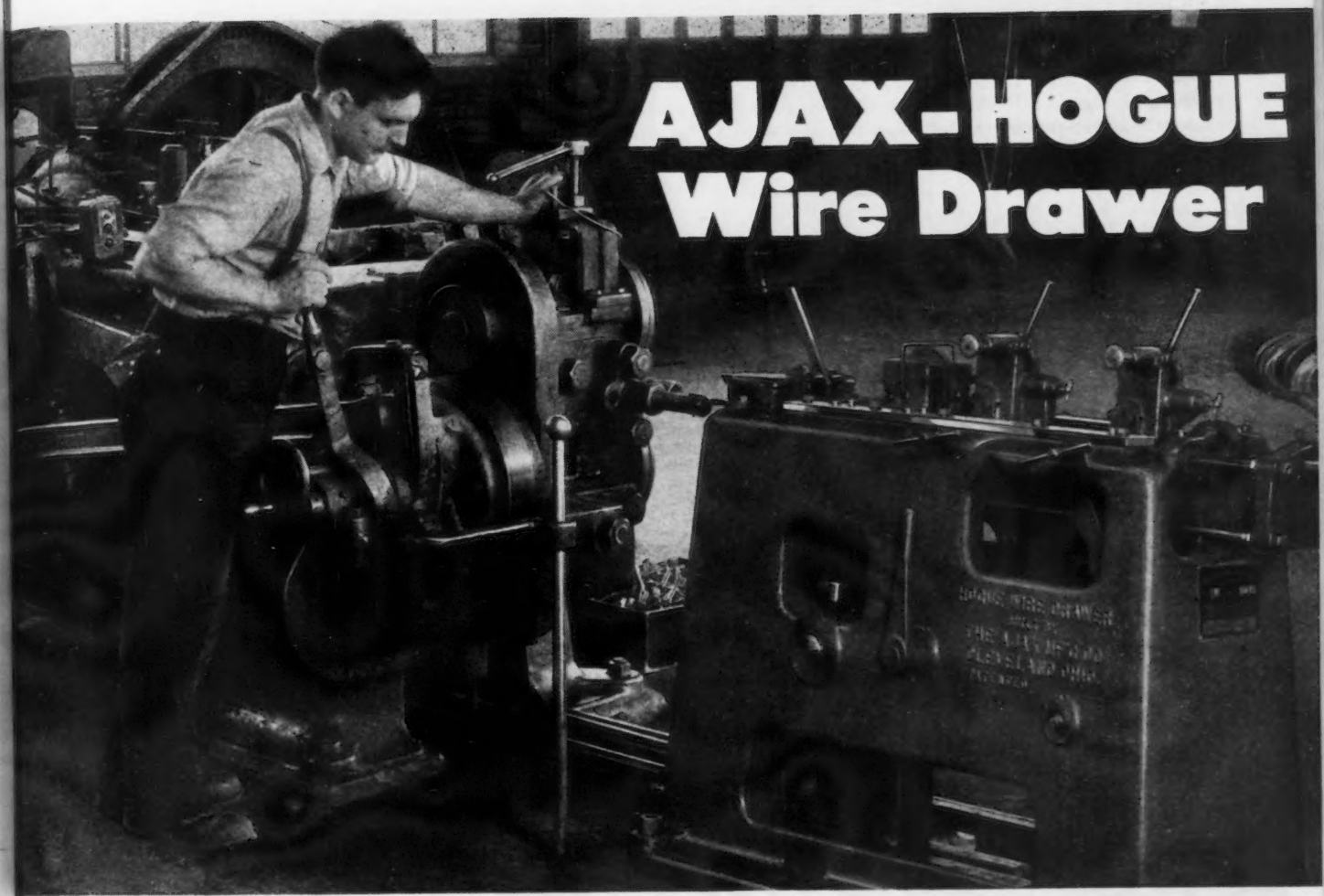
TABLE II

Analyses and Hot Workability Tests on Several Type 304 and 321 Steels

Heat "A" Type 304			Heat "B" Type 304			Heat "C" Type 304		
Analysis	Temperature, Deg. F.	Twists	Analysis	Temperature, Deg. F.	Twists	Analysis	Temperature, Deg. F.	Twists
C 0.04	2100	29	C 0.07	2200	33	C 0.06	2200	33
Mn 0.65	2200	42	Mn 0.50	2250	41	Mn 0.37	2250	31
S 0.007	2250	49	S 0.020	2300	49	S 0.009	2300	37
P 0.009	2300	64	P 0.014	2350	48	P 0.017	2350	42
Si 0.50	2350	75	Si 0.30	2400	50	Si 0.32	2400	44
Cr 18.60	2400	84	Cr 17.90	2450	51	Cr 18.18	2450	35
Ni 10.28	2450	95	Ni 8.35	....	..	Ni 10.31	....	..

Heat "D" Type 321			Heat "E" Type 321			Heat "F" Type 321		
Analysis	Temperature, Deg. F.	Twists	Analysis	Temperature, Deg. F.	Twists	Analysis	Temperature, Deg. F.	Twists
C 0.07	2100	62	C 0.05	2100	55	C 0.06	2100	46
Mn 0.78	2150	71	Mn 0.40	2150	60	Mn 1.31	2150	46
S 0.007	2200	65	S 0.009	2200	41	S 0.015	2200	49
P 0.025	2250	86	P 0.012	2250	40	P 0.019	2250	46
Si 0.40	2300	80	Si 0.60	2300	37	Si 0.36	2300	43
Cr 17.87	2350	72	Cr 18.50	2350	36	Cr 17.92	2350	42
Ni 10.22	2400	52	Ni 10.67	2400	38	Ni 12.48	2400	45
Ti 0.64	2450	12	Ti 0.45	2450	42	Ti 0.63	....	..

This Attachment for Cold Headers



Lowers Material and Heading Die Costs... Steps up Quality and Accuracy

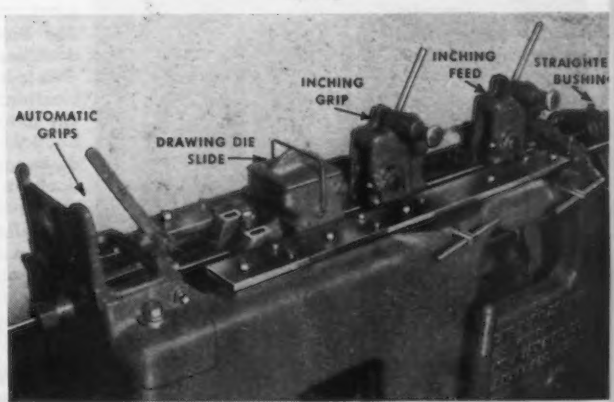
The Ajax-Hogue Wire Drawer makes it possible to produce highest quality cold headed products from less costly hot-rolled stock instead of cold drawn wire.

Header die life is greatly increased, especially on close specification products, due to the clean, straight, accurate wire freshly drawn from hot rolled, pickled and limed rod, and fed into the header dies immediately after drawing.

In the smaller wire diameters, commercial drawn wire is redrawn for diameter accuracy and straightness when heading many Class 3 products, for uniformity of finished product with better die life.

Write for Bulletin No. 111

The Ajax-Hogue Wire Drawer can help you cut heading costs and improve your close tolerance headed products.



THE AJAX MANUFACTURING COMPANY
EUCLID BRANCH P. O. CLEVELAND, OHIO
621 MARQUETTE BUILDING • CHICAGO, ILLINOIS

failure at various temperatures. The number of revolutions made before failure is a measure of the ductility of the metal at that temperature. By running the test at different temperatures, the optimum one for mill operations is indicated by the test temperature showing the highest number of turns. With only about 30 lb. of steel it is possible to obtain numerical data on the hot working properties of any heat for comparison with other steels and for correlation with mill results.

Getting High Strength Soldered Joints from Electrotinned Steel Sheet

HOW methods of cleaning steel sheet in preparation for electrotinning influence the strength of soldered joints has been investigated by A. W. Hothersall, D. W. Hopkins and G. L. Evans and presented before the British Iron and Steel Institute. The effect on the joint strength of the weight of the tin coating, the time of storing the plated sheet before soldering and the type of solder were also examined.

The method used for cleaning the steel sheet in preparation for electrotinning was found to have a marked effect upon the strength of the soldered joint as determined by a tearing test, especially when an acid tin bath, having the following composition, was employed:

	Grams per Liter
Stannous sulphate crystals	25
Sulphuric acid	50
Cresol sulphonic acid	20
β-Naphthol	1
Gelatine	2

With this bath the type of cleaning cycle ordinarily used in electroplating practice gave low joint strengths, and the initially low strength further decreased appreciably on heating the plated sheet before soldering to the temperature required for stoving tinplate lacquers. It was found, however, that by treatment in an alkaline solution containing 100 grams of sodium hydroxide and 100 grams of sodium carbonate per liter after pickling and immediately before plating in the acid bath joint strengths were markedly improved and no loss in strength was produced by heat treating the plated sheets before soldering.

Using the alkaline solution prior to the acid electrolyte treatment resulted in joint strengths for any given steel sheet and method of pickling were closely similar to those obtained with the sodium stannate bath and were at least equal to those given by hot dipped tinplate made from similar steel.

Loss of joint strength was attributed to the adsorption of gelatine from the acid plating solution, which occurs more readily in a medium more acid than pH 4.9. It was discovered* that clean steel sheet treated in alkaline solution is left with a film of alkaline liquid held in pores in the surface or by any solid film—for example, of residues from pickling—and that this alkaline film retards adsorption of gelatine by the steel base until deposition of tin has commenced.

**This discovery has been covered by British patent application No. 15324/42.*

Joint soldered after storage of the electrotinned sheet were less strong than when the sheet was freshly tinned. With dry storage the strength fell in 16 weeks by 10 per cent (sodium stannate bath, 4-oz. coatings) and 15 per cent (acid tin bath, 4-oz. coatings, with pre-treatment in alkali). The deterioration in joint strength was more rapid when soldering followed storage in a corrosive atmosphere.

Soldered joints increased in strength on keeping for 16 weeks, the amount of the increase varying with solder containing 40 per cent tin from 6 to 30 per cent, according to the conditions of electrotinning. With 60 per cent tin solder, the increase was greater, reaching 70 per cent.

GE Scientist Awarded Medal

• • • **Willem Frederik Westendorp,** of the X-ray section of the General Electric research laboratory in Schenectady, received the John Price Wetherill Medal from the Franklin Institute for his development of the resonance transformer which made possible the million-volt X-ray apparatus now in use by many war industries.

ANOTHER ORIGINAL AJAX DEVELOPMENT!

THE ISOTHERMAL HEAT-TREAT PROCESS

Battery of Ajax-Hultgren electric salt bath furnaces for Isothermal Treatment of SAE 4140 alloy steel parts: Hardening Bath 1550° F., Quench Bath 700° F., Draw Bath 1000° F.

1. ELIMINATES QUENCH CRACKS
2. REDUCES DISTORTION
3. AVOIDS SCALE AND DECARB
4. INCREASES TOUGHNESS WITH SAME HARDNESS

Isothermal quenching in this process gives results superior to the conventional quench-and-temper method of treating carbon-alloy steels. Stresses that produce quench cracks and distortion are eliminated. For the same final hardness the physical properties, such as ductility and tensile strength, are improved (as much as 25,000 psi in some cases).

This three-step salt bath process consists of austenizing in the first unit, followed by immersion in the isothermal quench for transformation, and then immediate transfer to the final draw bath—all three steps occurring in a rapid and uniform cycle.

With this Ajax 3-step process, the "S" curves (Time-Temperature-Transformation) are now translatable directly into practice by any heat treater. This is important because until now no production equipment was available for doing what Time-Temperature-Transformation data shows clearly can be done.

Investigate the wide range of usefulness opened up by freedom from limitations of the conventional quench-and-temper method. Send for the simplest practical exposition ever offered on this subject: "Isothermal Quench Bath: Theory and Practice." It will be sent free on request.

NOTE: We are prepared to treat specimen products by this new process for direct comparison.

AJAX ELECTRIC COMPANY, INC.
Frankford Ave. at Delaware Ave., Philadelphia 23, Pa.

...GIVES THE HEAT TREATER A REMARKABLE NEW TOOL OF PRODUCTION!

THE AJAX ELECTRIC SALT BATH FURNACE
HULTGREN

ASSOCIATE COMPANIES:
AJAX METAL COMPANY, *Non-Ferrous Ingot Metal for Foundry Use*
AJAX ELECTRIC FURNACE CORPORATION, *Ajax-Wyatt Induction Furnaces for Melting*
AJAX ELECTROTHERMIC CORPORATION, *Ajax-Northrup Induction Furnaces for Melting, Heating*
AJAX ENGINEERING CORPORATION, *Ajax-Tama-Wyatt Aluminum Melting Furnaces*

Contour Control Device Uses Air Gage Principle

(CONTINUED FROM PAGE 80)

rear portion of the cross cylinder and applying hydraulic pressure in the front portion of the cylinder, thus carrying the cross slide and tracer inward. This movement brings the tracer into contact with the template and increases the flow of air from the pilot nozzle; when the air loading pressure reaches its neutral value, movement of the cross slide stops. Simultaneously, the contour pilot valve returns to its neutral position and locks the cross slide by applying hydraulic pressure to both sides of the power cylinder.

In operation the air loading pressure does not vary appreciably from the 35 lb. neutral since any tendency to depart from this pressure causes almost instantaneous movement of the cross slide in the direction required to restore the neutral loading pressure.

The rate of longitudinal feed is controlled by the feed pilot valve (right) which in effect throttles the oil drain from the longitudinal power cylinder in accordance with changes in air loading pressure. The maximum rate of drain from the cylinder and consequently the maximum rate of feed occurs when the air loading pressure is at the 35 lb. neutral. Either an increase or a decrease in air loading pressure from this value decreases the rate of feed. If the deviation from the neutral air loading pressure is sufficient, longitudinal feed is stopped altogether, such as when facing a square shoulder.

While the possibilities of application are wider, use of the device at the present time is being limited to lathes and vertical boring mills. Fig. 2 shows its application to a 12-in. Hendey lathe. The control power unit rides back and forth on a monorail track with the movement of the lathe carriage to which the longitudinal power cylinder is attached. This power unit consists of an oil reservoir, a motor driven oil pump, hydraulic pilot valves for feed and contouring action, and directional flow selector valves which provide for setting up the machine to turn, bore or face.

Since Bailey contour control functions by the regulation of fluid flows in both the pneumatic and the hydraulic systems, there is said to be no backlash or lost motion on either side of the neutral tracer position. Furthermore, the air loading pressure which transmits the requirements for tool positioning is a recise indication of the accuracy with which the cut is progressing. As long as the gage in the air loading pressure system indicates the neutral loading pressure of 35 lb., the operator knows that the cutting tool is in position to produce extreme accuracy. If the air loading pressure increases to 37 lb. or decreases to 33 lb., the operator knows that an error of 0.001 in. has been introduced. By use of this continuous visual sizing method, the operator can increase the rate of feed up to the allowed tolerance simply by watching the indicating gage on the air loading pressure. Convenient adjustments for both the rate of feed and the rate of contouring action are provided so that a maximum rate of production consistent with the required accuracy may be maintained at all times.

Identification Chart for Stainless Steel Available

• • • The Carpenter Steel Co., Reading, Pa., has prepared a convenient chart for use in separating stainless types that show marked differences in their chemical and physical properties. It diagrams the Stainless Type Numbers and describes 11 tests for separating the various types. The tests do not supplant chemical analysis, but they do provide a handy and quick method for segregation.

COMING EVENTS

April 25 to 28—American Foundrymen's Association, Buffalo.

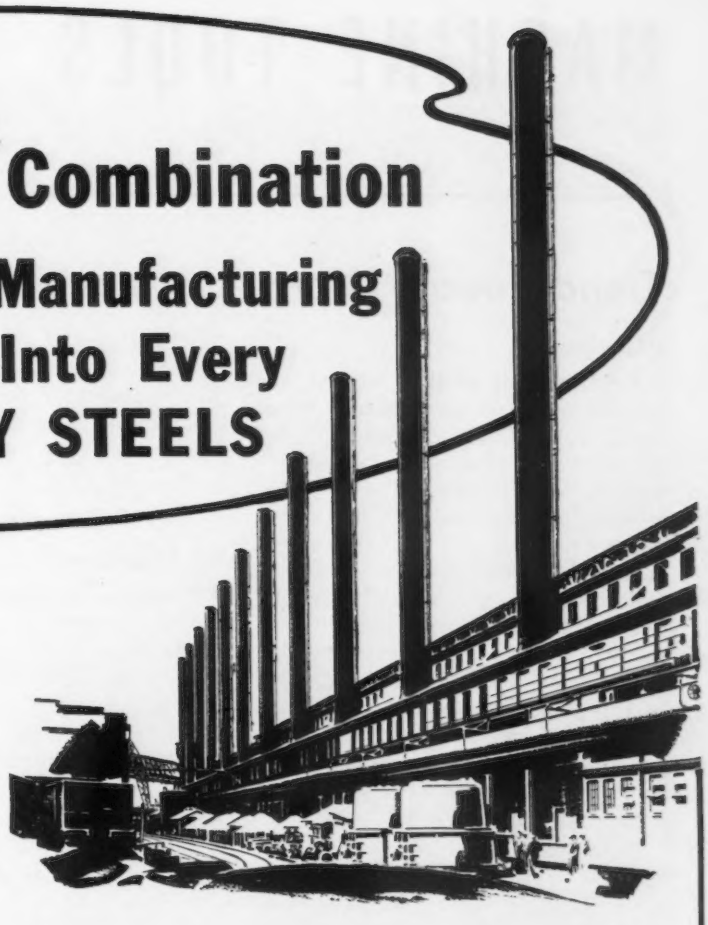
May 1, 2—Westinghouse Machine Tool Electrification Forum, Pittsburgh.

May 8—Association of Iron & Steel Engineers, spring conference, rolling mill committee, Pittsburgh.

May 9, 10—American Steel Warehouse Association, Inc., Chicago.

May 25—American Iron and Steel Institute, New York.

The *Right* Combination of Materials and Manufacturing "Know-How" Goes Into Every Ton of Our ALLOY STEELS



THE *right* combination of materials and manufacturing "know-how" goes into *every* ton of Wisconsin Alloy Steels, with skilled manpower supervising every operation.

Other factors, too, are important in our steel production. A thorough knowledge of customer requirements is one. Unified control of all operations, from mines to finished product, is another. A series of scrutinizing checks and double-checks, from the time the order is placed until the shipment is on its way to the customer, is another.

This follow-through makes Wisconsin Alloy Steels a QUALITY product . . . your assurance of user satisfaction.

WISCONSIN STEEL PRODUCTS

Open Hearth Alloy and Carbon Steel

Rounds, Flats, Squares, Bands, Skelp, Screw Steel

Agricultural and Special Shapes

Structural Angles, Beams, and Channels

Universal Plates

Cold Drawn and Turned Shafting

Pig Iron: Malleable, Foundry, Bessemer, and Basic

WISCONSIN STEEL COMPANY

AFFILIATE OF INTERNATIONAL HARVESTER COMPANY

General Offices: 180 North Michigan Avenue **Chicago 1, Illinois**

MACHINE TOOLS

. . . News and Market Activities

Trend Toward More Automaticity

Cleveland

• • • **Unspecific as they** may be, the general trends in machine tool design which will be followed by the industry in postwar tool building are beginning to become plain. The first consideration of builders will be that of reduced labor costs for the manufacturer. New tools are certain to follow designs which will more and more shift the burden for both production speed and accuracy from the workman to the machine. The effect of this will be to require less skilled workers at lower wage rates, meanwhile increasing production and maintaining or bettering much of present accuracy standards.

Consequently, the nature of new machine tools is likely to shift even more definitely toward the more fully automatic and the skilled mechanic will be replaced by briefly trained men operating specialized machines each doing only a limited operation.

The trend is not entirely toward special machines but a greater emphasis in this direction is expected and many standard machines are leaning toward specialization. One factor behind this trend is the success that has been experienced during the war emergency in training green hands to do only one operation with semi-automatic equipment. This revolution in practice is bound to leave its imprint in postwar operating practice and machine design.

Beyond the broad aim to produce machines of a more highly automatic nature stands the goal of higher speeds and greater productive time on tools. It has long been recognized that higher-cutting speeds could be attained within the limitations of cutting tool capabilities, but too frequently gains in increased cutting speeds were sacrificed to irregular material flow to the machines, lengthy setup time or the time required to stop and start or alter cutting speeds.

Hence, one of the leading aims of new design will be to step up the speed of machine loading operations and reduce the time required for changing cutting speeds. Much of the problem of time lost in changing from one operating speed to another such as in the case of a lathe and also that of attaining infinitely variable speeds will undoubtedly be solved electronically by some tool builders.

•

General Campbell to Speak At Machine Tool Conference

• • • **Levin H. Campbell, Jr.,** chief of the Ordnance Department, will speak at the War Conference of the American Machine Tool Distributors' Association, which will be held at French Lick, Ind., on May 25 and 26. John S. Chafee, director of Tools Division, WPB, Washington, will talk on May 26.

Albert M. Stedfast of Stedfast & Roulston, Inc., president of the association, will open the conference, following which Tell Berna, general manager, National Machine Tool Builders' Association, will speak. W. R. King, General Electric Co., will talk on the advance of electronics in the machine tool field and electronic adjustable speed drives will be discussed by S. A. Fendley, also of General Electric.

A. G. Bryant, chairman of the association's committee on government relations, will speak on Washington developments, while J. Roy Porter will discuss postwar disposal of surplus machine tools.

•

W & S Postwar Plans Include New Lines of Machinery

Cleveland

• • • **In discussing** the postwar outlook of the Warner & Swasey Co., in a letter to stockholders, Charles J. Stilwell, president, stated: "The Warner & Swasey Co. has manufactured machine tools for 64 years and it will remain in that business. To do so successfully will require the careful redesign and improvement of our machines, the searching analysis and cultivation of additional markets in this country and for export, and the development or acquisition of new products to be built and sold from the company's plants."

"For more than a year we have had a postwar planning group," Mr. Stilwell said, "engaged in new design and in the exploration of new products including not only machine tools but other types of machines. A beginning has already been made in the acquisition of the assets of the Bakewell Mfg. Co., Los Angeles, manufacturers of precision tapping machines. Negotiations are underway for the acquisition or licensing of the manufacture of several other types of machine equipment and still further negotiations are in prospect."

Net earnings of $1,696,270 were reported for 1943 after deductions of $2,500,000 for postwar reserves and after income and excess tax provisions. Earnings in 1942 were $1,960,848. Reserves of $7,000,000 set up out of earnings since 1941 were reduced by $1,534,487 by renegotiation for 1942, and further renegotiation on 1942 and 1943 business is still pending. Net profit per dollar of sales after reserves was 3.33 per cent in 1943, 3.80 per cent in 1942, and averaged 15.31 per cent for the eight pre-war years 1934 to 1941, inclusive.

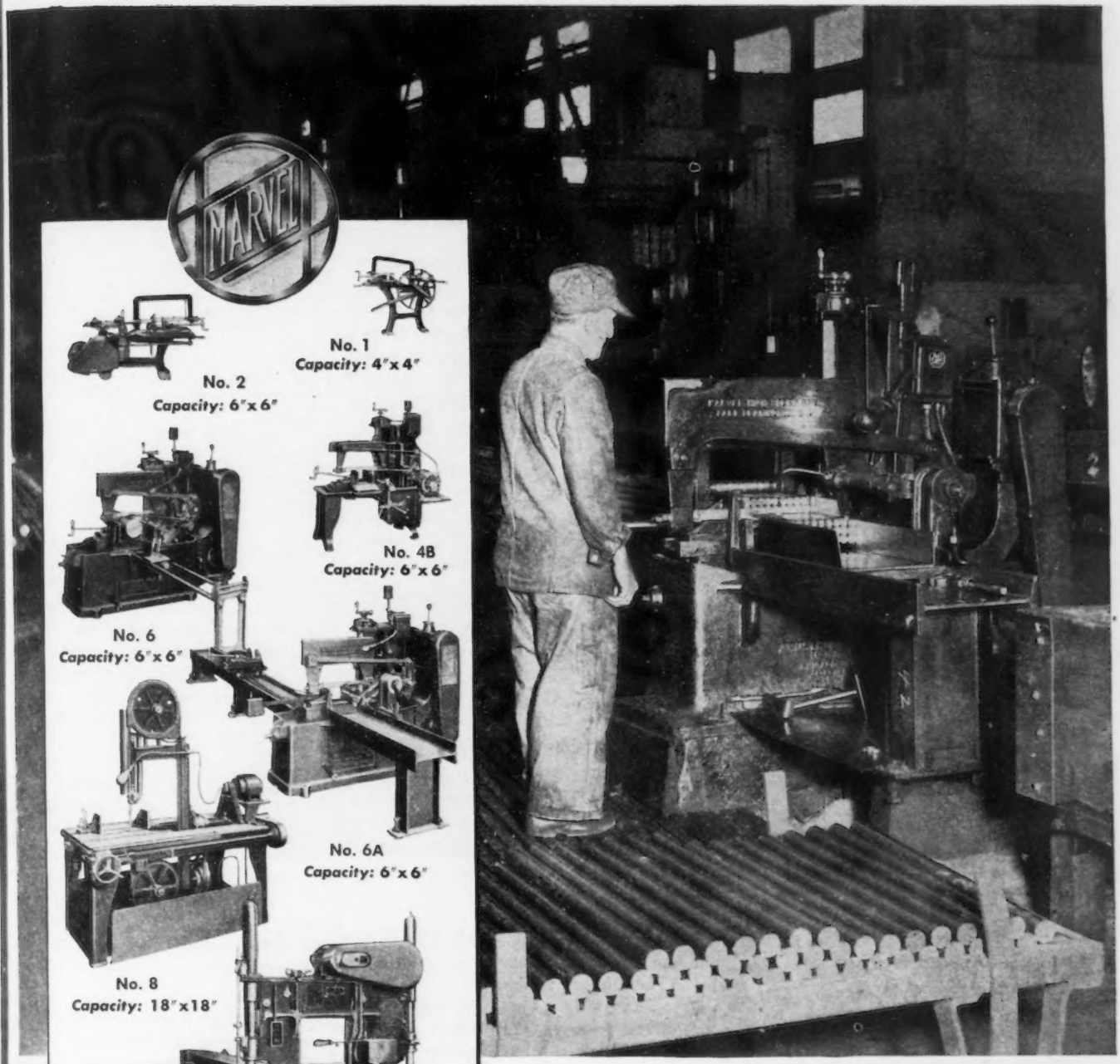
•

Lend Lease Orders Boost Machine Tool Business

Cincinnati

• • • **A modest increase** in the volume of lend-lease orders during the past couple of weeks has boosted the current new business, particularly of certain manufacturers above the average of the current year. The business, largely for shipment to Russia, includes virtually all the usual types of machine tools, although reports indicate that heavier types predominate. Manufacturers of planers and boring mills received a particularly brisk amount of business, while producers of lathes and drills are also included on the list. One manufacturer, in discussing the new business indicated there was sufficient now on the books to maintain his present high rate of production through the remainder of this year.

Elsewhere in the district a modest flow of business continues, but the downward curve of production is definitely established, as manufacturers seek to regulate the production with the shrinking supply of personnel.



This MARVEL 9A Production Saw paid its cost in 30 days

There's none of the old fashioned, tedious, plugging-along type of hack sawing at the Shop of the I. C. Railway, because they do their cutting-off with a high speed MARVEL No. 9A Production Saw—the same MARVEL Saw used to cut-off astronomical numbers of rifle and machine gun barrels.

Built for continuous heavy-duty operation, this really fast, all-ball-bearing saw automatically feeds, measures and cuts-off single or nested bars with no more operator attention than an automatic screw machine. On the job illustrated above, six hours after forty 18' x 1" steel bars were laid on the saw's feed rack, they had been cut into 840 accurate, 10-inch lengths, for staybolts. Equally efficient on both production runs and miscellaneous cuts, this saw "paid for itself in the first thirty days of operation".

Write for New Catalog

ARMSTRONG-BLUM MFG. CO.

5700 Bloomingdale Ave. Chicago 39, U.S.A.

Eastern Sales Office: 225 Lafayette St., New York 12, N. Y.

NON-FERROUS METALS

. . . News and Market Activities

Magnesium Statistics for 1942 Released

• • • **Primary magnesium** production in the United States in 1942 exceeded the combined output of all previous years since the inception of the industry in this country in 1915, according to the Bureau of Mines, which just released the data previously withheld because of censorship regulations. Output of primary magnesium in 1942 totaled 97,925,684 lb., 200 per cent more than that in 1941 (32,589,052 lb.) and 682 per cent more than the 1940 production (12,521,726 lb.). Dow Chemical Co. continued to be the largest domestic producer, using brines at Midland, Mich., and sea water at Freeport, Tex. Dow Magnesium Co. began production during 1942 from sea water at Velasco, Tex. Permanente Metals Corp. continued to produce magnesium from its Hansgirg carbothermal process plant at Permanente, Cal., and also began operation of a new ferrosilicon process plant at Manteca, Cal. Seven new companies in the field began production during 1942: Diamond Magnesium Co., Painesville, Ohio, and International Minerals & Chemical Co., Austin, Tex., using the standard Dow type of electrolytic cell; Mathieson Alkali Works, Inc., at Lake Charles, La., which produced metal only from a pilot plant in 1942, using a new type of electrolytic cell; Basic Magnesium, Inc., at Las Vegas, Nev., using the so-called M.E.L. process (developed by I. G. Farbenindustrie A. G. and used by Magnesium Elektron, Ltd., in England); Ford Motor Co., Dearborn, Mich., Magnesium Reduction Co., Luckey, Ohio, and New England Lime Co., Canaan, Conn., using the recently developed ferrosilicon process by which calcined dolomite is reduced, under high vacuum at 1150 deg. C., by 75 per cent ferrosilicon to produce magnesium metal.

Actual consumption of magnesium (from primary and secondary sources) totaled 84,525,700 lb. in 1942. Of this total, 75 per cent was used in the manufacture of magnesium-base alloy structural products, 17 per cent in aluminum alloys, 7 per cent in pyrotechnics, and 1 per cent in other uses.

o o o

Moly, Tungsten Output in Danger

• • • **A combination of** tremendous increase in demand, as well as a serious manpower shortage, has affected the output of molybdenum and tungsten. According to some sources, the manpower situation may become so serious that the production of important orders for these two materials may be affected. Some producers have been continually losing employees because of the draft and other reasons. Actual output of molybdenum and tungsten this year may not outstrip last year's record level, both for domestic and lend-lease purposes, even though demand is greater.

•

No Price Control for Small Castings

• • • **Small orders for** non-ferrous castings—known in the industry as nuisance orders—were exempted from price control by the OPA within certain specified limits.

The action, OPA said, will result in the releasing from price control of a negligible volume of castings, but, as an aid to industry, it will free producers from the detail and paper work of calculating ceilings on "nuisance orders."

"Nuisance sales" are exempted from price control, subject to the following limitations:

1—The order, in the case of copper base castings, must not exceed 25 pieces of any one pattern design, and the total weight of the pieces, before machining, must not exceed 150 lb. In the case of aluminum base or magnesium base castings, the order must not exceed 25 pieces of any one pattern design, and the total weight must not exceed 100 lb.

2—In the case of copper base castings, all small orders from one buyer must not exceed 50 pieces of one design, and all orders to one buyer must not total more than 450 lb. in the 30 days immediately preceding receipt of the order to be filled, including the particular order. In the case of aluminum base and magnesium base castings, all small orders from one buyer must not exceed 50 pieces of one design, and all orders to one buyer must not total more than 300 lb.

3—The exemption from price control does not apply to castings for which prices are provided in a pricing agreement or contract, price list, or schedule, such as a flat price for similar castings or groups of castings, at the time of receipt of the orders.

4—The exemption does not apply to castings that are the same as others sold, contracted for, delivered or offered for sale to the same buyer in the 30 days before receipt of the order, for which ceiling prices already had been computed by the seller in keeping with OPA pricing provisions.

5—A statement must appear on the invoice, and on at least one copy of the invoice in the records of the seller, stating that the sale has been made under the provisions exempting it from price control.

6—On Jan. 15, April 15, July 15 and Oct. 15 of each year, the seller must file with OPA in Washington a statement giving: (a) the total quarterly volume in weight and dollar amount of all nonferrous castings of each metal base sold under the price control exemption provisions, and (b) the total volume in weight and dollar amount of all castings sold in accordance with the price ceilings established in Revised Maximum Price Regulation No. 125—Nonferrous Castings.

•

Briefs . . .

• • • **Copper production** (in terms of recoverable metal) from domestic mines (including Alaska) was 86,420 short tons in February, a decrease of 2126 tons from that in January, according to preliminary estimates of the Bureau of Mines. The average daily production in February was 2980 tons.

• • • **In February the production** of lead (in terms of recoverable metal) from domestic mines (including Alaska) was 37,730 short tons, down 403 short tons from the January level. Average daily production in February was 1301 tons, an increase of 85 tons a day over the average daily production of 1216 tons for 1943.

• • • **Output of recoverable** zinc from domestic mines in February calculated from production of zinc concentrates by mills, individual and custom, was 64,977 tons, a decrease of 618 tons from January production of 65,595 tons. The average daily production in February was 2241 tons compared with 2116 tons in January, an increase of 125 tons, and an increase of 212 tons over the 1943 daily average of 2029 tons.

• • • **An entirely revised edition** of the New Jersey Zinc Co. bulletin "Zamak Alloys for Zinc Alloy Die Castings" is available for the asking. New technical data based on results of investigations of die casting are included. From these studies it was found that improvements in die casting equipment and die design have had a marked influence on die castings of zinc alloys. This 64-page bulletin may be obtained by writing the New Jersey Zinc Co., 160 Front Street, New York 7.

NICKEL AIDS THE ELECTRICAL EQUIPMENT INDUSTRY

to KEEP 'EM OPERATING!

ELECTRICAL ENGINEERS continue their spectacular progress.

Since Pearl Harbor they have designed and perfected equipment that frees military strategy from many of its old limitations.

Through tireless motors big and small, through tiny electronic tubes and gigantic motor generators, through a myriad of instruments and machines these men have put electrical energy to work for Victory.

Constantly striving to improve its products, the electrical industry has acquired long experience with metals and alloys of many kinds.

This experience has demonstrated that when properly used, nothing quite takes the place of Nickel. From resistor grids to armature shafts, from limit switches to reduction gears, Nickel and its alloys have been assuring the dependability so important in equipment that must not fail . . . even under wartime overloads.

Nickel imparts toughness, strength, and fatigue resistance to other metals . . . makes them stand up better under abrasion, wear, shock, and stress.

As in other industrial fields, a little Nickel goes a long way to keep electrical equipment operating.

For years we have enjoyed the privilege of cooperating with technical men of the electrical equipment industry . . . and of many others. Whatever *your* industry may be . . . if you want help in the selection, fabrication, and heat treatment of alloys . . . we offer you counsel and data.

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REFINER, SMELTER PRICES

(Cents per lb. unless otherwise noted)

Aluminum, 99+%, del'd	15.00
Aluminum, No. 12 Fdy., (No. 2)	12.00
Aluminum, deoxidizing grades	11.00 to 12.25
Antimony, Asiatic, New York	Nominal
Antimony, American, f.o.b. Laredo, Tex.	14.50
Arsenic, prime white, 99%	4.00
Brass, 85-5-5-5 ingots (No. 115)	13.00
Cadmium, del'd	90.00
Cobalt, 97-99% (dollars per lb.)	$2.11
Copper, electro, Conn. Valley	12.00
Copper, electro, New York	11.75
Copper, lake	12.00
Copper, beryllium, 3.75-4.25% Be; dollars per lb. contained Be	$15.00
Gold, U. S. Treas., dollars per oz.	$35.00
Indium, 99.5%, dollars per troy oz.	$7.50
Iridium, dollars per troy oz.	$165.00
Lead, St. Louis	6.35
Lead, New York	6.50
Magnesium, 99.9+%, carlots	20.50
Magnesium, 12-in. sticks, carlots	30.00
Mercury, dollars per 76-lb. flask, f.o.b. shipping point or port of entry	$191 to $193.00
Nickel, electro	35.00
Palladium, dollars per troy oz.	$24.00
Platinum, dollars per oz.	$35.00
Silver, open market, New York, cents per oz.	44.75
Tin, Straits, New York	52.00
Zinc, East St. Louis	8.25
Zinc, New York	8.67

Copper, Copper Base Alloys

(Mill base, cents per lb.)

	Extruded Shapes	Rods	Sheets
Copper	20.87	....	20.87
Copper, H.R.	....	17.37	....
Copper, drawn	....	18.37	....
Low brass, 80%	....	20.40	20.15
High brass	....	....	19.48
Red brass, 85%	....	20.61	20.36
Naval brass	20.37	19.12	24.50
Brass, free cut	....	15.01	....
Commercial bronze, 90%	....	21.32	21.07
Commercial bronze, 95%	....	21.53	21.28
Manganese bronze	24.00	....	28.00
Phos. bronze, A, B, 5%	....	36.50	36.25
Muntz metal	20.12	18.87	22.75
Everdur, Herculoy, Olympic or equal	....	25.50	26.00
Nickel silver, 5%	....	28.75	26.50
Architect bronze	19.12	....	.

Aluminum

(Cents per lb., subject to extras on gage, size, temper, finish, factor number, etc.)

Tubing: 2 in. O.D. x 0.065 in. wall 2S, 40c. (½H); 52S, 61c. (O); 24S, 67½c. (T).

Plate: 0.250 in. and heavier: 2S and 3S, 21.2c.; 52S, 24.2c.; 61S, 22.8c.; 24S, 24.2c.

Flat Sheet: 0.188 in. thickness; 2S and 3S, 22.7c. a lb.; 52S, 26.2c.; 61S, 24.7c.; 24S, 26.7c.

2000-lb. base for tubing; 30,000-lb. base for plate, flat stock.

Extruded Shapes: "As extruded" temper; 2000-lb. base, 2S and 3S, factor No. 1 to 4, 25.5c.; 14S, factor No. 1 to 4, 35c.; 17S, factor No. 1 to 4, 31c.; 24S, factor No. 1 to 4, 34c.; 53S, factor No. 1 to 4, 28c.; 61S, factor No. 1 to 4, 28½c.

The factor is determined by dividing perimeter of shape by weight per lineal foot.

Wire Rod and Bar: Base price; 17ST and 11ST-3, screw machine stock. Rounds: ¼ in., 28½c. per lb.; ½ in., 26c.; 1 in., 24½c.; 2 in., 23c. Hexagonals: ¼ in., 34½c. per lb.; ½ in., 28½c.; 1 in., 25½c.; 2 in., 25½c. 2S, as fabricated, random or standard lengths, ¼ in., 34c. per lb.; ½ in., 25c.; 1 in., 24c.; 2 in., 23c. 24ST, rectangles and squares, random or standard lengths. 0.093-0.187 in. thick by 1.001-2.000 in. wide, 33c. per lb.; 0.751-1.500 in. thick by 2.001-4.000 in. wide, 29c.; 1.501-2.000 in. thick by 4.001-6.000 in. wide, 27½c.

Magnesium

Sheet, rod, tubes, bars, extruded shapes subject to individual quotations. Metal turnings: 100 lb. or more, 46c. a lb.; 25 to 90 lb., 56c.; less than 25 lb., 66c.

NON-FERROUS SCRAP METAL QUOTATIONS

(OPA basic maximum prices, cents per lb., f.o.b. point of shipment, subject to quality, quantity and special preparation premiums)

Copper, Copper Base Alloys

OPA Group 1	
No. 1 wire, No. 1 heavy copper	9.75
No. 1 tinned copper wire, No. 1 tinned heavy copper	9.75
No. 2 wire, mixed heavy copper	8.75
Copper tuyeres	8.75
Light copper	7.75
Copper borings	9.75
No. 2 copper borings	**8.75**
Lead covered copper wire, cable	6.00*
Lead covered telephone, power cable	6.04
Insulated copper	5.10*
OPA Group 2	
Bell metal	15.50
High grade bronze gears	13.25
High grade bronze solids	11.50*
Low lead bronze borings	11.50*
Babbitt lined brass bushings	13.00
High lead bronze solids	10.00*
High lead bronze borings	10.00*
Red trolley wheels	10.75
Tinny (phosphor bronze) borings	10.50
Tinny (phosphor bronze) solids	10.50
Copper-nickel solids and borings	9.25
Bronze paper mill wire cloth	9.50
Aluminum bronze solids	9.00
Soft red brass (No. 1 composition)	9.00
Soft red brass borings (No. 1)	9.00
Gilding metal turnings	8.50
Contaminated gilded metal solids	**8.50**
Unlined standard red car boxes	8.25
Lined standard red car boxes	7.75
Cocks and faucets	7.75
Mixed brass screens	7.75
Red brass breakage	7.50
Old nickel silver solids, borings	6.25
Copper lead solids, borings	6.25
Yellow brass castings	6.25
OPA Group 3	
Yellow brass soft sheet clippings	8.625
Yellow rod brass turnings	8.375
Zincy bronze borings	8.00
Zincy bronze solids	8.00
Fired rifle shells	8.25
Brass pipe	7.50
Old rolled brass	7.00
Admiralty condenser tubes	7.50
Muntz metal condenser tubes	7.00
Plated brass sheet, pipe reflectors	6.50
Manganese bronze solids	7.25[1]
Manganese bronze solids	6.25[2]
Manganese bronze borings	6.50[1]
Manganese bronze borings	5.50[2]
OPA Group 4	
Automobile radiators	7.00
OPA Group 5	
Refinery brass	5.00*

*Price varies with analysis. [1] Lead content 0.00 to 0.40 per cent. [2] Lead content 0.41 to 1.00 per cent.

Other Copper Alloys

Briquetted Cartridge Brass Turnings	8.625
Cartridge Brass Turnings, Loose	7.875
Loose Yellow Brass Trimmings	7.875

Aluminum

Plant scrap, segregated	
All S-type alloys (except 2S)	8.50
2S solids	8.00
High grade alloys	7.00
Low grade alloys	6.50
Borings and turnings	
High grade alloys	5.50
Low grade alloys	5.00
Plant scrap, mixed	
All solids	6.00
Borings and turnings	4.00
Obsolete scrap	
Pure cable	8.00
Old sheet and utensils	7.00
Old castings and forgings	6.50
Pistons, free of struts	6.50
Pistons, with struts	4.50
Old alloy sheet	5.50

For old castings and forgings, pistons, sheets, add ½c. lb. for lots 1000 to 19,999 lb.; for other scrap add 1c.; for lots over 19,999 lb. add 1½c. a lb.

Magnesium

Segregated plant scrap	
Pure solids and all other solids, exempt	
Borings and turnings	8.00
Mixed, contaminated plant scrap	
Grade 1 solids	11.00
Grade 1 borings and turnings	7.00
Grade 2 solids	9.00
Grade 2 borings and turnings	5.00

For lots over 1499 lb. add 1c. per lb.

Zinc

New zinc clippings, trimmings	7.25
Engravers', lithographers' plates	7.25
Old zinc scrap	5.75
Unsweated zinc dross	5.50
Die cast slab	5.50
New die cast scrap	4.95
Radiator grilles, old and new	4.95
Old die cast scrap	4.50

Lead

Deduct 0.55c. a lb. from refined metal basing point prices or soft and hard lead inc. cable, for f.o.b. point of shipment price.

Nickel

Ni content 98+%, Cu under ½%, 26c. per lb.; 90 to 98% Ni, 26c. per lb. contained Ni.

ELECTROPLATING ANODES AND CHEMICALS

Anodes

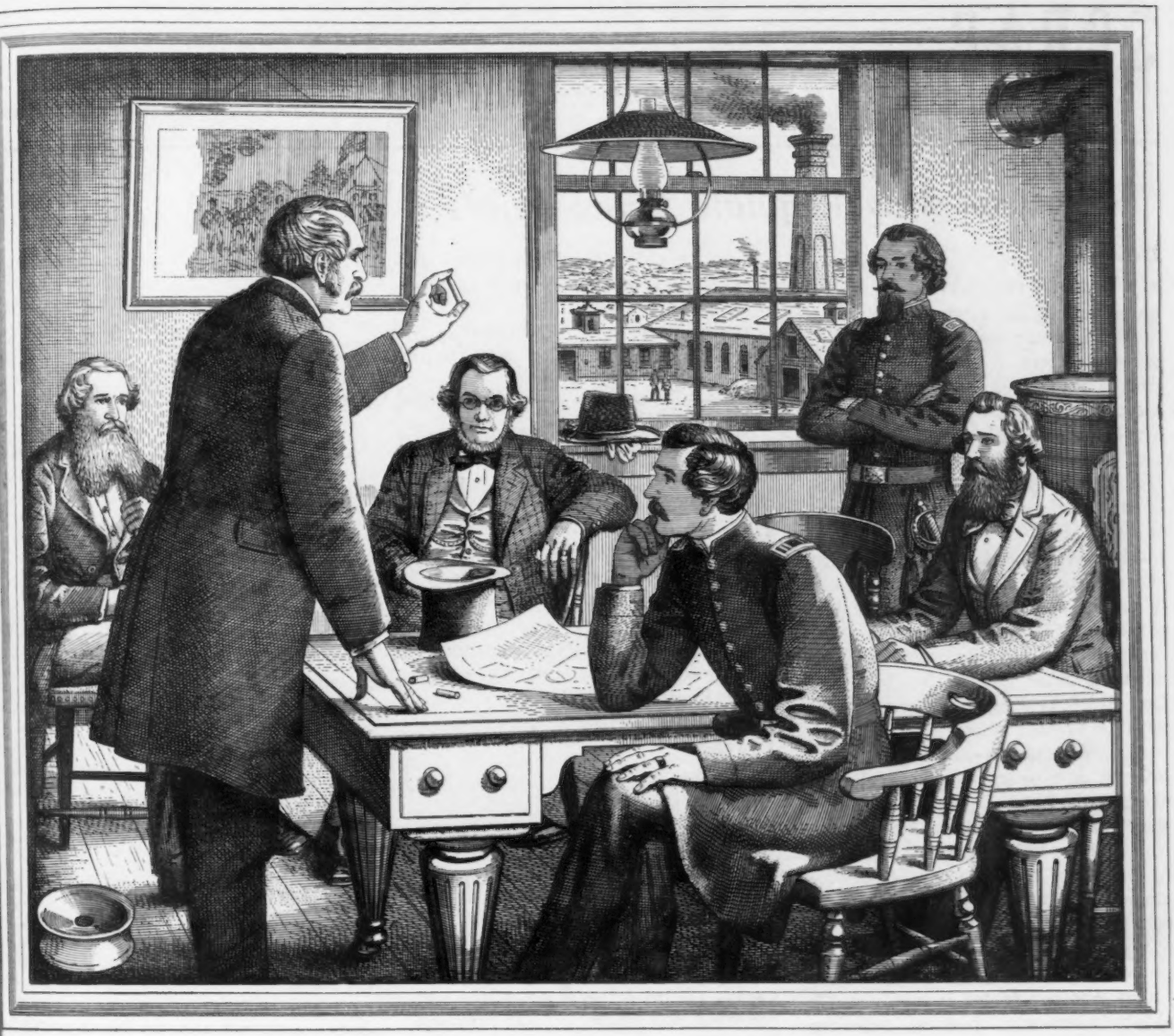
(Cents per lb., f.o.b. shipping point)

Copper: Cast, elliptical, 15 in. and longer	25⅛
Electrolytic, full size	22⅞
cut to size	30⅛
Rolled, oval, straight, 15 in. and longer	23¼
Curved	24¼
Brass: Cast, 82-20, elliptical, 15 in. and longer	23⅝
Zinc: Cast, 99.99, 16 in. and over	16¼
Nickel: 99% plus, cast	47
Rolled, depolarized	48
Silver: Rolled, 999 fine per Troy (1-9) oz., per oz.	58

Chemicals

(Cents per lb., delivery from New York)

Copper cyanide, tech., 100-lb. bbls. 1-5	5.65
Copper sulphate, 99.5 crystals, bbls.	13.00–13.50
Nickel salts, single, 425-lb. bbls.	34.00
Silver cyanide, 100 oz., lots	40.82–41.13
Sodium cyanide, 96% dom., 100-lb. dms.	0.15
Zinc cyanide, 100-lb. dms.	33.00
Zinc, sulphate, 89% crystals, bbls.	6.80



"You make General McClellan's munitions ...we'll make your new cartridge BRASS"

THE birth of packaged death occurred in the office of a New England munitions maker soon after the start of the War Between the States, in the Union's darkest hour. The munitions men had developed the idea of the rim-fired brass cartridge . . . but couldn't start a new brass mill under pressure of wartime demands. So the Connecticut brass industry took over the development and production of special brass for this critical use. Then followed the repeating rifle and carbine . . . replacing paper cartridges and hand-rammed powder and ball . . . tipping the scales of the Union cause with a dependable, deadly advantage. Conceivably, the war was won on that spring day of 1862.

Ever since, the Naugatuck Valley has been the No. 1 brass arsenal for ammunition makers. And in this, the fifth war in which Bristol Brass has served as a member of America's industrial gun crew, the same situation exists now as then . . . except that Bristol Brass sheet, rod and wire now rolls to the ends of the earth, clicking smoothly into the gun-breeches of the troops of a score of Allied Armies, instead of one small force along the Potomac. Today, corps commanders and skippers of fighting ships take for granted what McClellan's staff hailed as a miracle . . . the fact that good Connecticut Yankee brass ammunition can take soaking, baking, and kicking around . . . and still leap with a shout from the trigger, whenever a free man's finger presses down in mortal need.

THE

BRISTOL BRASS CORPORATION

Makers of Brass since 1850, Bristol, Conn.

SCRAP

. . . News and Market Activities

Pig Iron May Regulate Scrap Prices

Detroit

• • • **Belief that** wartime blast furnace capacity expansion will hold iron and steel scrap prices to within very narrow ranges in the postwar period was expressed by Paul T. Farrell, director of purchases for Great Lakes Steel Corp., speaking before the Michigan chapter of the Institute of Scrap Iron and Steel, Inc. He predicted that if scrap prices rise too much during the period after the war in a free market, steel plants will increase iron charges in steelmaking operation, utilizing the sharply increased capacity available for pig iron. But, good scrap will always be used, he said, when its price holds at levels permitting steel production at costs comparable to the use of iron.

At present, Great Lakes' open hearths are operating on high iron charges of 60 to 70 per cent, against a normal ratio of 40 to 50 per cent iron and the balance scrap. The average ratio in the industry is believed close to 50 per cent iron and 50 per cent scrap.

With open hearth scrap charges reduced by this practice at Great Lakes, another factor is involved. To obtain necessary chemical reactions and meet specifications, large amounts of iron ore are being utilized directly in the open hearth. About 45 ton or ore per 200 ton heat are frequently used, the ore replacing 20 to 25 tons of what otherwise would be scrap.

Mr. Farrell touched on the problem of residuals in alloy scrap and contamination of heats from these residuals, a subject that is bothering steel people studying postwar prospects. If utilization of alloy scrap produces postwar problems, he said, a higher percentage of virgin iron will likely be used to dilute the alloys in the scrap. "This in itself may be a factor in continuing high iron charges," he pointed out.

Great Lakes Steel Co. and other steel producers are finding their purchased scrap needs reduced today because, among other factors, a larger proportion of home scrap is being produced. Alloy steel products and carbon steel ship plate, both being made at Great Lakes, yield more scrap than the light gage strip mill products normally rolled at Ecorse.

However, Mr. Farrell indicated that a change from these types of products may be made within a short time when he said, "For the time being I am not literally a scrap buyer. However, Great Lakes Steel Co. has been an important scrap buyer and may be again in a couple of months."

Institute Cancels Midyear Convention

• • • **In deference to the wishes of the ODT directors of the Institute of Scrap Iron & Steel, Inc., have voted to forego its annual midyear convention. The directors will hold a quarterly meeting early in July and several committees of the Institute will meet if the situation warrants.**

CHICAGO—Incoming shipments of shipyard scrap from the west coast have placed district mills in an extremely comfortable position. This is reflected in mills becoming more finicky in local purchases. Rejections, particularly of baled machine shop turnings, have been higher in the past fortnight than at any time since the start of the war emergency. The machine shop turnings market remains dormant insofar as new mill purchases are concerned and there is little change in the quiet market for blast furnace grades. Previously reported price concessions in these categories may be considered to prevail. Some quarters feel that a decreasing flow from out of district is exerting a leavening influence on the price situation for blast furnace grades which may be felt in the indefinite future.

•

CLEVELAND — Scrap sales here received a rather unexpected shot in the arm by limited sales in Cleveland proper and improved demand for both open hearth and blast furnace grades in the Valley. Alloys are also reported improved with some credit for this given to the WPB alloy scrap charging directive. Stocks of blast furnace grades, kept at low levels due to manpower shortages and in anticipation of a market break over the past few months, have been caught short. Prices, as a result of improved demand are reported firmer.

•

CINCINNATI—Dealers continue to report a strong adherence to price ceilings on all items except alloys and turnings, which on occasion are reported to be selling at about $2 under the ceiling. Except for foundry grades, dealers indicate an easier market so far as supply is concerned, with most users being apparently sufficiently supplied. Production scrap, of course, continues to be the chief source at the present time, while agricultural grades are scarce due to inability to make collections.

•

BIRMINGHAM—Unless steps are taken soon to alleviate the labor shortage and unless restrictions on trucks and tires are eased, trade sources here say a scrap shortage before the end of the year appears probable. Supplies of most grades are none too plentiful at present even though there is no substantial demand in this area for any grade except open hearth.

•

ST. LOUIS—Floods and preoccupation of farmers with spring work are reflected in a further decline in scrap arrivals from the country. Receipts generally continue under current consumption. Items which are scarcest and in heaviest demand are No. 2 heavy melting steel and cast scrap.

•

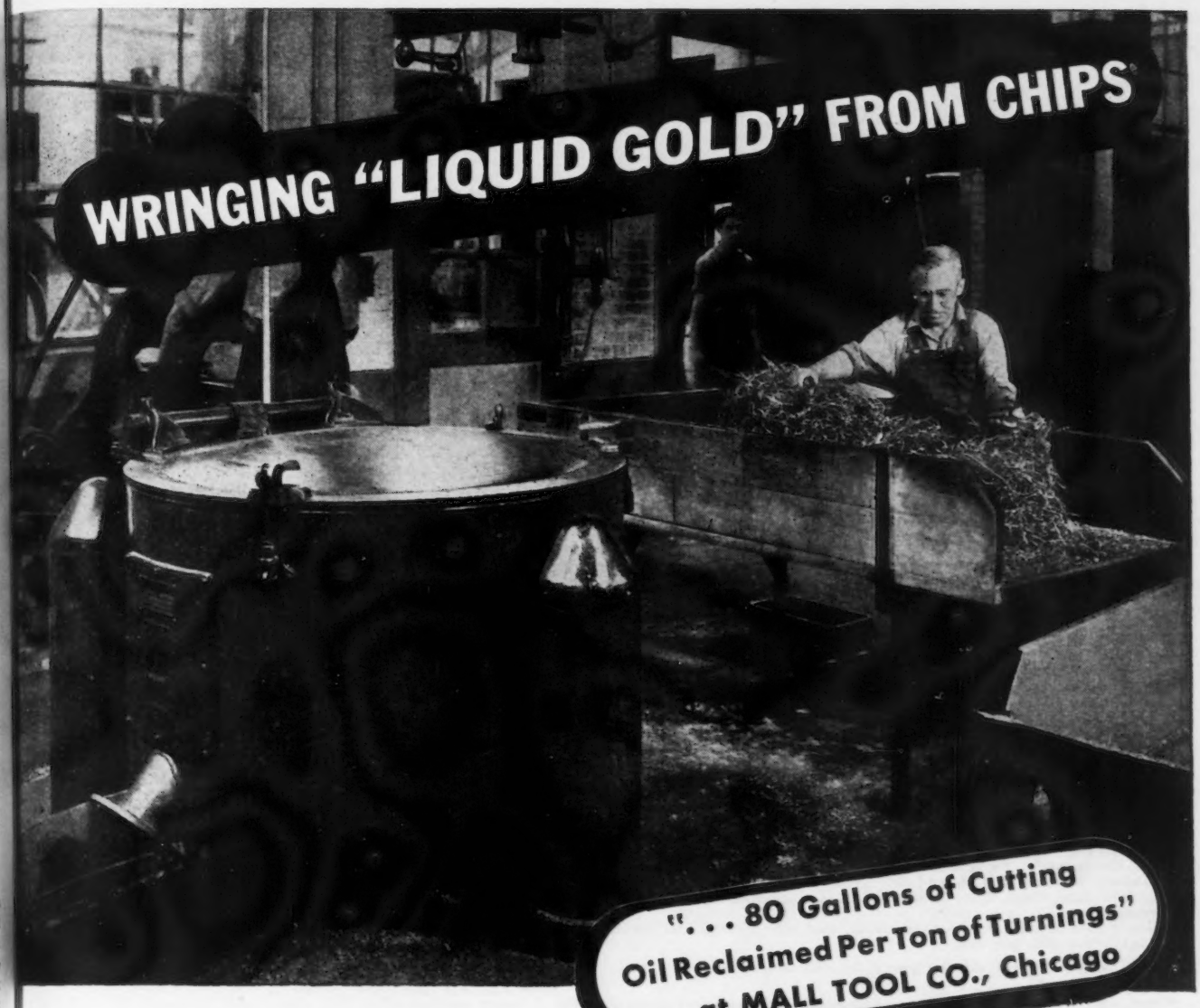
PHILADELPHIA — Several mills this week have refused to pay the springboard on turnings and heavier open hearth grades. Dealers and brokers here are viewing this action with alarm but think that although these mills may succeed in breaking the turnings price, they will not be successful with the heavy grades since the supply is not sufficiently great. However, it is too early for definite conclusions as to the result of this refusal. Low phos is still difficult to sell even with price concessions.

•

BOSTON—Weakness has developed in turnings. Following holdup of shipments, Pittsburgh consumers offer Providence firms $9.30 a ton, as against $9.60, heretofore. Production of turnings is heavy and yards are accumulating them. Borings, on the other hand, are comparatively scarce. Firms heretofore making 150 tons a month now produce less than a third that amount. Some yards have stopped taking automobile scrap, having no help to prepare it.

•

BUFFALO—Continued buying by all three of the district's consumers emphasizes there is no over-supply of scrap in Buffalo, despite a move to break prices. Turnings are dragging because of the principal consumer's demand for tonnage at $14, 25c. under the ceiling, and less broker commission. No sales at this figure have been reported, but when new contracts are entered into May 1, dealers will face the problem of yielding or storing. Demand for prime open hearth and foundry cast remains firm.



TOLHURST CHIP WRINGERS—recover up to 98.6% of valuable cutting oil from metal chips through the application of *centrifugal force only*. At this busy Chicago plant the saving with a Tolhurst is 80 gallons per ton of screw machine turnings.

TOLHURST USERS HAVE NOTED

REDUCED TOOL WEAR—Tool room records show as much as 50% reduction in tool wear run with Tolhurst equipment installed. A plentiful supply of fresh reclaimed oil encourages a more conscientious use of cutting oil . . . hence longer tool life.

INCREASED CHIP VALUE—Dry chips, ready for remelt, bring higher scrap prices. Machineable pieces of metal, otherwise scrapped, are also retrieved as part of the routine operation.

CLEANER PLANT—Frequent collection and processing of chips results in cleaner floors, reducing of fire and personal accidents.

SIMPLE OPERATION—Unskilled help can efficiently operate the simple routine of Tolhurst Chip Wringers—8 to 10 loads per hour.

Save Cutting Oil—Save Metal—Write for details and prices!

ARMY E NAVY

TOLHURST CHIP WRINGERS

TOLHURST CENTRIFUGAL DIVISION • ***American Machine and Metals, Inc., East Moline, Illinois***

"Since 1852 — CENTRIFUGAL MAKERS FOR THE PROCESS INDUSTRIES"

IRON AND STEEL (OTHER THAN RAILROAD) SCRAP

(All Prices Are Per Gross Ton)

	BASIC OPEN HEARTH GRADES		BLAST FURNACE GRADES				ELECTRIC FURNACE, ACID OPEN HEARTH AND FOUNDRY GRADES										
							Low Phos.		Heavy Structural and Plate			Foundry Steel					
	No. 1 & 2 Hvy. Melt. No. 1 Cp. Blk. Shts. No. 1 & 2 Bundles No. 1 Busheling	Unbaled* Machine Shop Turnings	Mixed Borings and Turnings	Cast Iron Borings	Shovelling Turnings	No. 2 Busheling	Billet, Bloom, Forge Crops	Bar Crops, Punchings Plate Scrap and Cast Steel	3 ft. and Under	2 ft. and Under	1 ft. and Under	2 ft. and Under	1 ft. and Under	Auto. Springs, and Crankshafts	Alloy Free Low Phos. and Sulphur Turnings	Heavy Axle and Forge Turn. First Cut	Electric Furnace Bundles
Pittsburgh, Brackenridge, Butler, Monessen, Midland, Johnstown, Sharon, Canton, Steubenville, Warren, Youngstown, Weirton	$20.00	$15.00	$15.00	$16.00	$17.00	$17.50	$25.00	$22.50	$21.50	$22.00	$22.50	$21.50	$22.00	$21.00	$18.00	$19.50	$21.00
Cleveland, Middletown, Cincinnati, Portsmouth	19.50	14.50	14.50	15.50	16.50	17.00	24.50	22.00	21.00	21.50	22.00	21.00	21.50	20.50	17.50	19.00	20.50
Chicago, Claymont, Coatesville, Conshohocken, Harrisburg, Phoenixville, Sparrows Point	18.75	13.75	13.75	14.75	15.75	16.25	23.75	21.25	20.25	20.75	21.25	20.25	20.75	19.75	16.75	18.25	19.75
Ashland, Ky.	19.50	14.50	14.50	15.50	16.50	17.00	24.50	22.00	21.00	21.50	22.00	21.00	21.50	20.50	17.50	19.00	20.50
Buffalo, N. Y.	19.25	14.25	14.25	15.25	16.25	16.75	24.25	21.75	20.75	21.25	21.75	20.75	21.25	20.25	17.25	18.75	20.25
Bethlehem, Pa.; Kokomo, Ind.	18.25	13.25	13.25	14.25	15.25	15.75	23.25	20.75	19.75	20.25	20.75	19.75	20.25	19.25	16.25	17.75	19.25
Duluth, Minn.	18.00	13.00	13.00	14.00	15.00	15.50	23.00	20.50	19.50	20.00	20.50	19.50	20.00	19.00	16.00	17.50	19.00
Detroit, Mich.	17.85	12.85	12.85	13.85	14.85	15.35	22.85	20.35	19.35	19.85	20.35	19.35	19.85	18.85	15.85	17.35	18.85
Toledo, Ohio	.....	12.85	12.85	13.85	14.85	15.35	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
St. Louis, Mo.	17.50	12.50	12.50	13.50	14.50	15.00	22.50	20.00	19.00	19.50	20.00	19.00	19.50	18.50	15.50	17.00	18.50
Atlanta, Ga.; Alabama City, Ala.; Birmingham, Los Angeles, Pittsburg, Cal; San Francisco	17.00	12.00	12.00	13.00	14.00	14.50	22.00	19.50	18.50	19.00	19.50	18.50	19.00	18.00	15.00	16.50	18.00
Minnequa, Colo.	16.50	11.50	11.50	12.50	13.50	14.00	21.50	19.00	18.00	18.50	19.00	18.00	18.50	17.50	14.50	16.00	17.50
Seattle, Wash.	14.50	9.50	9.50	10.50	11.50	12.00	19.50	17.00	16.00	16.50	17.00	16.00	16.50	15.50	12.50	14.00	15.50

* Baled turnings are $5 per gross ton higher.

BUNDLES: Tin can bundles are $4 below dealers' No. 2 bundles; No. 3 bundles are $2 less than No. 1 heavy melting.

AT NEW YORK CITY or Brooklyn, the maximum shipping point price is $15.33 for No. 1 heavy melting, f.o.b. cars, f.a.s. vessel or loaded on trucks. Minimum set at $14 per gross ton at any shipping point in U. S. Other grades carry differentials similar to those in table. New Jersey prices must be computed on basis of all-rail. At Boston the maximum is $15.05 for No. 1 f.o.b. cars, f.a.s. vessel or loaded on trucks. Shipments from a New England shipping point to a consumer outside New England carry maximum transportation charge of $6.66 per ton.

SWITCHING CHARGES: Deductions for shipping points within basing point (cents per gross ton) are: Chicago, 84c.; Pittsburgh, Brackenridge, 55c.; Detroit, 53c.; Midland, Johnstown, Sharon, Youngstown, Warren, Weirton, Cleveland, Toledo, Los Angeles, San Francisco, Pittsburg, 42c.; Seattle, 38c.; Buffalo, Claymont, Harrisburg, 36c.; Atlanta, Birmingham, 32c.; Butler, Monessen, Canton, Steubenville, Cincinnati*, Portsmouth, Ashland, Coatesville, Phoenixville, Bethlehem, Kokomo, Duluth and St. Louis, 28c.; Alabama City, Ala., 26c.; Minnequa, Colo., 22c.; Middletown, 14c.; Conshohocken, Sparrows Point, 11c.

*Basic open hearth and foundry grades, and auto springs and crankshafts, deduct 80c. per ton.

BASING POINT includes switching districts of city named.

Basing point	Switching districts:
Pittsburgh	Bessemer, Homestead, Duquesne, Munhall, McKeesport
Cincinnati	Newport
St. Louis	Granite City, E. St. Louis, Madison, Ill.
Chicago	Gary
Claymont	Chester, Pa.
San Francisco	So. San Francisco, Niles, Oakland

MAXIMUM SHIPPING POINT PRICE: Where shipment is wholly or partially by rail or vessel, or combination of rail and vessel, the scrap is at shipping point when placed f.o.b. railroad or f.a.s. vessel. For motor vehicle shipments scrap is at shipping point when loaded. Then maximum shipping point price shall be: (a) For shipping point located within a basing point, prices shown in above table for scrap at basing point in which shipping point is located, minus applicable switching charge deduction shown in paragraph above labeled "Switching Charges." (b) For shipping points outside basing point, price listed in above table hereof for scrap at most favorable basing point, minus lowest charge for transportation from shipping point to such basing point by rail or water carrier or combination. Where vessel movement is involved, in lieu of established dock charge or any cost customarily incurred at the dock, 75c. per ton must be included as part of deduction in computing shipping point price; 50c. at Memphis; $1 at Great Lakes ports; and $1.25 at New England ports. If no established transportation rate exists for a portion of movement from shipping to basing point, actual charge or cost customarily incurred by shipper in such portion of movement shall be included as part of deduction in computing shipping point price. For exceptions see official order.

UNPREPARED SCRAP: For unprepared scrap, maximum prices shall be $3.50 (and in the case of the material from which No. 1, No. 2, and No. 3 bundles are made $4) less than maximum prices for the corresponding prepared scrap. In no case, however, shall electric furnace, acid open hearth and foundry grades be used as the corresponding prepared scrap. A preparation-in-transit charge for unprepared scrap is provided.

NEW LISTED GRADES: Priced in dollars per gross ton less than No. 1 heavy melting steel. Pit scrap, ladle skulls, slag reclaim, etc., of 85% or more Fe priced less $2; 75 to 85% Fe less $4; under 75% Fe less $8 per ton. Mill scale less $8 per ton. Mill cinder and grindings, shipping point maximum price of $4 per gross ton at all U. S. shipping points.

CHEMICAL BORINGS: No. 1 (new, clean, containing not more than 1% oil), $1 less than No. 1 heavy melting; No. 2 (new, clean, containing not more than 1.5% oil), $2 less than No. 1 heavy melting. If loaded in box cars add 75c. mill scale, $8 less than No. 1 heavy melting.

Tool Steel Scrap Prices (MPR 379)

	SEGREGATED Solids Per Lb. Cont. W	SEGREGATED Turnings Per Lb. Cont. W	UNSEGREGATED SOLIDS	UNSEGREGATED TURNINGS
Type 1. 12% min. W, 1% max. Mo	$1.80	$1.60	$1.50 per lb. contained W if 5% or more.	$1.30 per lb. contained W if 5% or more.
Type 2. 5 to 12% W, 1% max. Mo	1.60	1.40	$1.15 per lb. contained W if 1 to 5%.	$1.00 per lb. contained W if 1 to 5%.
Type 3. 1 to 5% W, 1.5% max. Mo	1.25	1.25	$0.80 per lb. contained Mo if 1.5% or more.	$0.70 per lb. contained Mo if 1.5% or more.
*Type 4. 7% min. Mo, 2% max. W	0.125	0.105	If both W and Mo are within ranges, payment may be for both W and Mo content.	
*Type 5. 3.5 to 6% Mo, 4.5 to 6% W	0.135	0.115		

*Per lb. of scrap material.

If segregated, a premium of $1.50 per lb. of contained Co allowed if Co content is 3% or over. No scrap considered segregated if Co content ranges between 0.5 and 3%.

If Cu or Ni content over 0.25%, price shall be reduced by 50%.

If 500 lb. or less is sold, either segregated or unsegregated, price shall be reduced 2c. per lb. of scrap material.

Cast Iron Scrap

Maximum on-line price, per gross ton, for any of the following cast grades will be the price shown at the highest priced zone in which the railroad operates or is located.

	Per Gross Ton		
	Zone A	Zone B	Zone C
Cast Iron, No. 1	$18.00	$19.00	$20.00
Cast Iron, No. 2	17.00	18.00	19.00
Cast Iron, No. 3	14.50	15.50	16.50
Cast Iron, No. 4	13.25	14.25	15.25
Cast Iron Brake Shoes	13.25	14.25	15.25
Malleable	20.00	21.00	22.00
Wheels, No. 1	18.00	19.00	20.00

Zone A includes Mont., Idaho, Wyo., Nev., Utah, Ariz., and N. M. Zone B includes N. D., S. D., Neb., Colo., Kan., Okla., Texas, and Fla. Zone C includes all states not named in zones A and B, and includes switching district of Kansas City, Kansas-Missouri.

For cast, an in-transit preparation fee will be applicable only for preparing Cast Iron No. 3 into Cast Iron No. 1, for which the maximum preparation fee shall be $3.50 per gross ton. (Previous dealer fee was $2.50.)

CAST IRON GRADE DEFINITIONS: Cast Iron, No. 1—Cast iron scrap such as columns, pipe, plates and/or castings of miscellaneous nature, but free from stove plate, brake shoes, and/or burnt scrap. Must be cupola size not over 24 x 30 in. and no pieces to weigh more than 150 lb. Free of foreign material. No. 2—Cast iron scrap in pieces weighing over 150 lb. not more than 500 lb. and free from burnt cast. No. 3—Cast iron scrap in pieces over 500 lb., includes cylinders, driving wheel centers, and/or all other castings. Free from hammer blocks or bases. No. 4—Burnt cast iron scrap such as grate bars, stove parts, and/or miscellaneous burnt scrap. No. 5—Driving and/or car brake shoes of all types except composition filled. Malleable—Malleable parts of automobiles, railroad cars, and locomotives. No. 7—Wheels, No. 1, includes cast iron car and/or locomotive wheels.

"PUT IT ON THE BLANCHARD"

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING

★ **Production**

★ **Adaptability**

Fixture Saving

Operation Saving

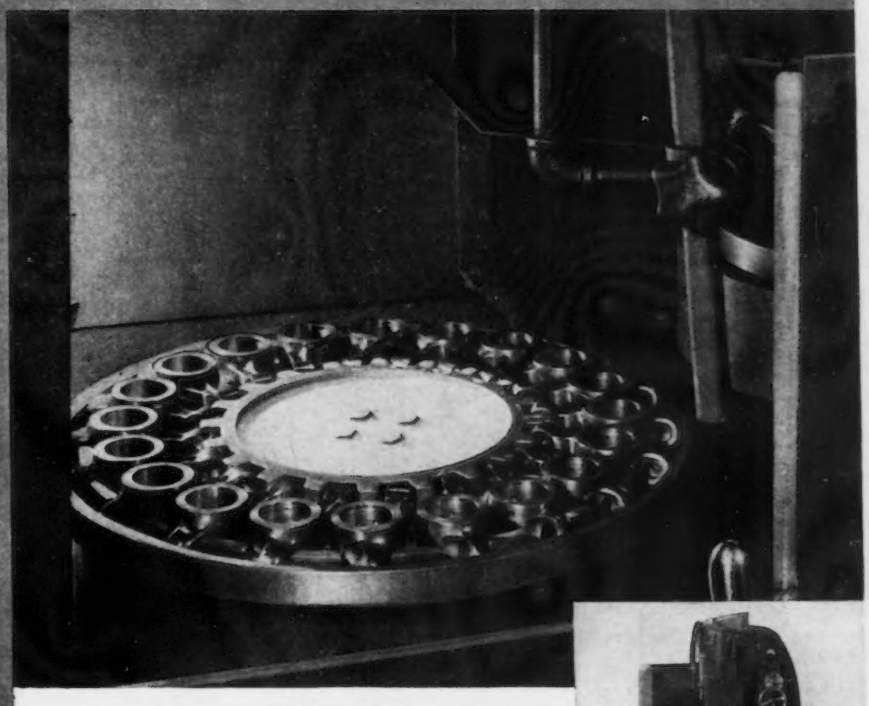
Material Saving

Fine Finish

★ **Flatness**

Close Limits

★ . . . . . *Especially valuable on jobs like the one illustrated.*



Grinding Steel Forged Rocker Arms on No. 11 Blanchard Surface Grinder

These steel forged Rocker Arms are ground on a No. 11 Blanchard Surface Grinder, with speed and economy.

Twenty pieces are loaded on a special Blanchard designed fixture. .005" of stock is removed from one side.

1800-2000 pieces are produced per eight hour shift.

The **BLANCHARD**

BLANCHARD

MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS.

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

Comparison of Prices . . .

Advances Over Past Week in **Heavy Type**; Declines in *Italics*. [Prices Are F.O.B. Major Basing Points]

Flat Rolled Steel: (Cents Per Lb.)	April 8, 1944	April 11, 1944	Mar. 14, 1944	April 20, 1943
Hot rolled sheets	2.10	2.10	2.10	2.10
Cold rolled sheets	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)	3.50	3.50	3.50	3.50
Hot rolled strip	2.10	2.10	2.10	2.10
Cold rolled strip	2.80	2.80	2.80	2.80
Plates	2.10	2.10	2.10	2.10
Plates, wrought iron	3.80	3.80	3.80	3.80
Stain's c.r. strip (No. 302)	28.00	28.00	28.00	28.00
Tin and Terne Plate: (Dollars Per Base Box)				
Tin plate, standard cokes	$5.00	$5.00	$5.00	$5.00
Tin plate, electrolytic	4.50	4.50	4.50	4.50
Special coated mfg. ternes	4.30	4.30	4.30	4.30
Bars and Shapes: (Cents Per Lb.)				
Merchant bars	2.15	2.15	2.15	2.15
Cold finished bars	2.65	2.65	2.65	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Stainless bars (No. 302)	24.00	24.00	24.00	24.00
Wrought iron bars	4.40	4.40	4.40	4.40
Wire and Wire Products: (Cents Per Lb.)				
Plain wire	2.60	2.60	2.60	2.60
Wire nails	2.55	2.55	2.55	2.55
Rails: (Dollars Per Gross Ton)				
Heavy rails	$40.00	$40.00	$40.00	$40.00
Light rails	40.00	40.00	40.00	40.00
Semi-Finished Steel: (Dollars Per Gross Ton)				
Rerolling billets	$34.00	$34.00	$34.00	$34.00
Sheet bars	34.00	34.00	34.00	34.00
Slabs, rerolling	34.00	34.00	34.00	34.00
Forging billets	40.00	40.00	40.00	40.00
Alloy blooms, billets, slabs	54.00	54.00	54.00	54.00
Wire Rods and Skelp: (Cents Per Lb.)				
Wire rods	2.00	2.00	2.00	2.00
Skelp	1.90	1.90	1.90	1.90

Pig Iron: (Per Gross Ton)	April 8, 1944	April 11, 1944	Mar. 14, 1944	April 20, 1943
No. 2 fdy., Philadelphia	$25.84	$25.84	$25.84	$25.89
No. 2, Valley furnace	24.00	24.00	24.00	24.00
No. 2, Southern Cin'ti	25.11	25.11	25.11	24.68
No. 2, Birmingham	20.38	20.38	20.38	20.38
No. 2, foundry, Chicago†	24.00	24.00	24.00	24.00
Basic, del'd eastern Pa.	25.34	25.34	25.34	25.39
Basic, Valley furnace	23.50	23.50	23.50	23.50
Malleable, Chicago†	24.00	24.00	24.00	24.00
Malleable, Valley	24.00	24.00	24.00	24.00
L. S. charcoal, Chicago	37.34	37.34	37.34	31.34
Ferromanganese‡	135.00	135.00	135.00	135.00

†The switching charge for delivery to foundries in the Chicago district is 60c. per ton.
‡For carlots at seaboard.

Scrap: (Per Gross Ton)	April 8, 1944	April 11, 1944	Mar. 14, 1944	April 20, 1943
Heavy melt'g steel, P'gh.	$20.00	$20.00	$20.00	$20.00
Heavy melt'g steel, Phila.	18.75	18.75	18.75	18.75
Heavy melt'g steel, Ch'go	18.75	18.75	18.75	18.75
No. 1 hy. comp. sheet, Det.	17.85	17.85	17.85	17.85
Low phos. plate, Youngs'n	22.50	22.50	22.50	22.50
No. 1 cast, Pittsburgh	20.00	20.00	20.00	20.00
No. 1 cast, Philadelphia	20.00	20.00	20.00	20.00
No. 1 cast, Ch'go	20.00	20.00	20.00	20.00
Coke, Connellsville: (Per Net Ton at Oven)				
Furnace coke, prompt	$7.00	$7.00	$7.00	$6.50
Foundry coke, prompt	8.25	8.25	8.25	7.375
Non-Ferrous Metals: (Cents per Lb. to Large Buyers)				
Copper, electro., Conn.	12.00	12.00	12.00	12.00
Copper, Lake	12.00	12.00	12.00	12.00
Tin (Straits), New York	52.00	52.00	52.00	52.00
Zinc, East St. Louis	8.25	8.25	8.25	8.25
Lead, St. Louis	6.35	6.35	6.35	6.35
Aluminum, Virgin, del'd.	15.00	15.00	15.00	15.00
Nickel, electrolytic	35.00	35.00	35.00	35.00
Magnesium, ingot	20.50	20.50	20.50	20.50
Antimony (Asiatic), N. Y.	16.50	16.50	16.50	16.50

The various basing points for finished and semi-finished steel are listed in the detailed price tables, pages 180-197.

Composite Prices . . .

Starting with the issue of April 22, 1943, the weighted finished steel price index was revised for the years 1941, 1942 and 1943. See explanation of the change on page 90 of the April 22, 1943, issue.

	FINISHED STEEL	PIG IRON	SCRAP STEEL
April 18, 1944	2.25513c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One week ago	2.25513c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One month ago	2.25513c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One year ago	2.26190c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton

	FINISHED STEEL HIGH	FINISHED STEEL LOW	PIG IRON HIGH	PIG IRON LOW	SCRAP STEEL HIGH	SCRAP STEEL LOW
1943	• 2.25513c.,	2.25513c.,	$23.61	$23.61	$19.17	$19.17
1942	2.26190c.,	2.26190c.,	23.61	23.61	19.17	19.17
1941	2.43078c.,	2.43078c.,	$23.61, Mar. 20	$23.45, Jan. 2	$22.00, Jan. 7	$19.17, Apr. 10
1940	2.30467c., Jan. 2	2.24107c., Apr. 16	23.45, Dec. 23	22.61, Jan. 2	21.83, Dec. 30	16.04, Apr. 9
1939	2.35367c., Jan. 3	2.26689c., May 16	22.61, Sept. 19	20.61, Sept. 12	22.50, Oct. 3	14.08, May 16
1938	2.58414c., Jan. 4	2.27207c., Oct. 18	23.25, June 21	19.61, July 6	15.00, Nov. 22	11.00, June 7
1937	2.58414c., Mar. 9	2.32263c., Jan. 4	23.25, Mar. 9	20.25, Feb. 16	21.92, Mar. 30	12.67, June 8
1936	2.32263c., Dec. 28	2.05200c., Mar. 10	19.74, Nov. 24	18.73, Aug. 11	17.75, Dec. 21	12.67, June 9
1935	2.07642c., Oct. 1	2.06492c., Jan. 8	18.84, Nov. 5	17.83, May 14	13.42, Dec. 10	10.33, Apr. 29
1934	2.15367c., Apr. 24	1.95757c., Jan. 2	17.90, May 1	16.90, Jan. 27	13.00, Mar. 13	9.50, Sept. 25
1933	1.95578c., Oct. 3	1.75836c., May 2	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan. 3
1932	1.89196c., July 5	1.83901c., Mar. 1	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.43, July 5
1931	1.99626c., Jan. 13	1.86586c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.25488c., Jan. 7	1.97319c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.31773c., May 28	2.26498c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3

Weighted index based on steel bars, beams, tank plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing 78 per cent of the United States output. Index recapitulated in Aug. 28, 1941, issue.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

40-TON STEEL SHAFT

for World's Largest Stern-Wheel Towboat

REPAIRED BY *Thermit Welding*

(Above) *One of the breaks on the 31" diameter shaft of the stern wheeler steamer, "Sprague."*

(Right) *The huge paddle wheel was set up on a barge preparatory to welding the shaft.*

(Above) *The finished Thermit weld, showing the Thermit collar, and heating gates and risers before removal by oxy-acetylene cutting.*

WHEN a 40-ton 31" diameter paddle wheel shaft broke in two places on the Steamer "Sprague," world's largest stern-wheel towboat, it presented quite a problem. Replacement was almost impossible because of the steel shortage and the time required. Therefore it was decided to repair the shaft by Thermit welding, the only practical method because of the size of the unit.

The work involved the usual steps in the Thermit welding process: (1) the broken ends of the shaft were flame-cut and lined up in position; (2) a wax pattern was made in the space the weld metal would occupy; (3) a mold box was constructed around the wax pattern; (4) the shaft ends were preheated; (5) the Thermit mixture was placed in a crucible over the mold box, ignited, the molten weld metal pouring into the gap and fusing with the parent metal in a strong, durable weld; (6) the pouring gates and risers were removed from the finished weld by oxy-acetylene cutting.

Thermit welding is often the only feasible method of repairing large, heavy parts. As the weld metal is deposited all at one time and only one shrinkage is involved, stress relieving is not necessary. Machining is seldom required except for removal of excess metal.

The Thermit process is also used for fabrication work where the great strength and durability of the welds and the ease of handling several small castings rather than one large one are decided advantages.

Write for the 30-page illustrated booklet which describes the process in detail.

METAL & THERMIT CORPORATION

Specialists in welding for nearly 40 years. Manufacturers of Murex Electrodes for arc welding and of Thermit for repair and fabrication of heavy parts.

120 BROADWAY, NEW YORK 5

ALBANY · CHICAGO · PITTSBURGH

SO. SAN FRANCISCO · TORONTO

Prices of Finished Iron and Steel . . .

Steel prices shown here are f.o.b. basing points, in cents per lb., unless otherwise indicated. Extras apply. Delivered prices do not reflect 3% tax on freight. (1) Mill run sheet, 10c. per lb. under base; primes 25c. above base. (2) Unassorted 8-lb. coating. (3) Widths up to 12-in. (4) 0.25 carbon and less. (5) Applies to certain width and length limitations. (6) For merchant trade. (7) For straight length material only from producer to consumer. Discount of 25c. per 100 lb. to fabricators. (8) Also shafting. For quantities of 20,000 to 29,999 lb. (9) Carload lot in manufacturing trade. (10) Prices do not apply if rail and water is not used. (12) Boxed. (13) Portland and Seattle price, San Francisco 2.50c. (14) This base price to be used in figuring annealed, bright finish wires, commercial spring wire.

Basing Point → / Product ↓	Pittsburgh	Chicago	Gary	Cleveland	Birmingham	Buffalo	Youngstown	Sparrows Point	Granite City	Middletown, Ohio	Gulf Ports, Cars	[10] Pacific Ports, Cars	DELIVERED TO Detroit	New York	Philadelphia
Hot Rolled Sheets	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.20¢	2.10¢		2.65¢	2.20¢	2.34¢	2.27¢
Cold Rolled Sheets[1]	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢		3.70¢	3.15¢	3.39¢	3.37¢
Galvanized Sheets (24 gage)	3.50¢	3.50¢	3.50¢		3.50¢	3.50¢	3.50¢	3.50¢	3.60¢	3.50¢		4.05¢		3.74¢	3.67¢
Enameling Sheets (20 gage)	3.35¢	3.35¢	3.35¢	3.35¢			3.35¢		3.45¢	3.35¢		4.00¢	3.45¢	3.71¢	3.67¢
Long Ternes[2]	3.80¢	3.80¢	3.80¢									4.55¢		4.16¢	4.12¢
Hot Rolled Strip[2]	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢		2.75¢	2.20¢	2.46¢	
Cold Rolled Strip[4]	2.80¢	2.90¢		2.80¢			2.80¢	(Worcester = 3.00¢)					2.90¢	3.16¢	
Cooperage Stock Strip	2.20¢	2.20¢			2.20¢		2.20¢							2.56¢	
Commodity C-R Strip	2.95¢	3.05¢		2.95¢			2.95¢	(Worcester = 3.35¢)					3.05¢	3.31¢	
Coke Tin Plate, Base Box	$5.00	$5.00	$5.00						$5.10					5.36¢	5.32¢
.50 Electro Tin Plate, Box	$4.50	$4.50	$4.50						$4.60						
.75 Electro Tin Plate, Box	$4.65		$4.65						$4.75						
Black Plate (29 gage)[5]	3.05¢	3.05¢	3.05¢						3.15¢			4.05¢[12]			3.37¢
Mfg. Ternes, Special Box	$4.30	$4.30	$4.30						$4.40						
Carbon Steel Bars	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢		(Duluth = 2.25¢)			2.50¢	2.80¢	2.25¢	2.49¢	2.47¢
Rail Steel Bars[6]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢					2.50¢	2.80¢			
Reinforcing (Billet) Bars[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.50¢	2.55¢[13]	2.25¢	2.39¢	
Reinforcing (Rail) Bars[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢				2.50¢	c2.55¢[13]	2.25¢		2.47¢
Cold Finished Bars[8]	2.65¢	2.65¢	2.65¢	2.65¢		2.65¢		(Detroit = 2.70¢)			(Toledo = 2.80¢)			2.99¢	2.97¢
Alloy Bars, Hot Rolled	2.70¢	2.70¢				2.70¢	(Bethlehem, Massillon, Canton = 2.70¢)						2.80¢		
Alloy Bars, Cold Drawn	3.35¢	3.35¢	3.35¢	3.35¢		3.35¢							3.45¢		
Carbon Steel Plates	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢	(Coatesville and Claymont = 2.10¢) 2.10¢	2.35¢		2.45¢	2.65¢	2.32¢	2.29¢	2.15¢
Floor Plates	3.35¢	3.35¢									3.70¢	4.00¢		3.71¢	3.67¢
Alloy Plates	3.50¢	3.50¢			(Coatesville = 3.50¢)						3.95¢	4.15¢		3.70¢	3.59¢
Structural Shapes	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢	(Bethlehem = 2.10¢)				2.45¢	2.75¢		2.27¢	2.215¢
SPRING STEEL, C-R 0.26 to 0.50 Carbon	2.80¢			2.80¢			(Worcester = 3.00¢)								
0.51 to 0.75 Carbon	4.30¢			4.30¢			(Worcester = 4.50¢)								
0.76 to 1.00 Carbon	6.15¢			6.15¢			(Worcester = 6.35¢)								
1.01 to 1.25 Carbon	8.35¢			8.35¢			(Worcester = 8.55¢)								
Bright Wire[14]	2.60¢	2.60¢		2.60¢	2.60¢		(Worcester = 2.70¢)		(Duluth = 2.65¢)			3.10¢			2.92¢
Galvanized Wire	Add proper size extra and galvanizing extra to Bright Wire base.														
Spring (High Carbon)	3.20¢	3.20¢		3.20¢			(Worcester = 3.30¢)					3.70¢			3.52¢
Steel Sheet Piling	2.40¢	2.40¢				2.40¢						2.95¢			2.72¢

EXCEPTIONS TO PRICE SCHED. NO. 6

Slabs—Andrews Steel Co. $41 basing pts.; Wheeling Steel Corp. $34 Portsmouth, Ohio; Empire Sheet & Tin Plate Corp. $41; Phoenix Iron Co. (rerolling) $41, (forging) $47; Granite City Steel Co. $47.50.

Blooms—Phoenix Iron Co. (rerolling) $41, (forging) $47.

Sheet Bar—Empire Sheet & Tin Plate Co. $39 mill; Wheeling Steel Corp. $38 Portsmouth, Ohio.

Billets, Forging—Andrews Steel Co. $50 basing pts.; Follansbee Steel Corp. $49.50 Toronto; Phoenix Iron Co. $47.00 mill.

Billets, Rerolling—Continental Steel Corp. may charge Acme Steel in Chicago switching area $34 plus freight from Kokomo, Ind.; Northwestern Steel & Wire Co. (Lend-Lease) $41 mill; Wheeling Steel Corp. (small) $36 Portsmouth, Ohio; (blooming mill sizes) applicable base, f.o.b. Portsmouth, Ohio; Stanley Works may sell Washburn Wire Co. under allocation at $39 Bridgeport, Conn.; Keystone Steel & Wire Co. may sell Acme Steel Co. at Chicago base, f.o.b. Peoria; Phoenix Iron Co. $41 mill; Continental Steel Corp. (1¾ x 1¾) $39.50, (2 x 2) $40.60 Kokomo, Ind. (these prices include $1 size extra); Keystone Steel & Wire Co. $36.40 Peoria; Connors Steel Co. $50.69 Birmingham; Ford Motor Co. $34 Dearborn, Mich.

Structural Shapes—Phoenix Iron Co. $2.35 basing pts., (export) $2.50 Phoenixville; Knoxville Iron Co. $2.30 basing pts.

Bar Size Shapes—(Angles) W. Ames & Co., 10 tons or over, $3.10 mill.

Rails—Sweet Steel Co. (rail steel) $50 mill; West Virginia Rail Co. (lightweight) on allocation based Huntington, W. Va.; Colorado Fuel & Iron Corp. $45 Pueblo.

Hot Rolled Plate—Granite City Steel Co. $2.65 mill; Knoxville Iron Co. $2.25 basing pts.; Kaiser Co. $3.20 Pacific Ports.

Merchant Bars—W. Ames & Co., 10 tons and over, $2.85 mill; Eckels-Nye Steel Corp., $2.50 basing pts. (rail steel) $2.40; Phoenix Iron Co. $2.40 basing pts.; Sweet Steel Co. (rail steel) $2.35 mill; Joslyn Mfg. & Supply Co. $2.35 Chicago; Central Iron & Steel Co. $2.20 basing pts.; Granite City Steel Co. $2.35 Granite City; Calumet Steel Div., Borg Warner Corp. (8 in. mill bars) $2.35 Chicago; Knoxville Iron Co. $2.30 basing pts. Laclede Steel Co., sales to LaSalle Steel granted Chicago base, f.o.b. Madison, Ill.

Reinforcing Bars—W. Ames & Co., 10 tons and over, $2.85 mill; Sweet Steel Co. (rail steel) $2.35 mill; Columbia Steel Co. $2.50 Pacific Ports.

Cold Finished Bars—Keystone Drawn Steel Co. on allocation, Pittsburgh c.f. base plus c/l freight on hot rolled bars Pittsburgh to Spring City, Pa.; New England Drawn Steel Co. on allocation outside New England. Buffalo c.f. base plus c/l freight Buffalo to Massfield, Mass., f.o.b. Massfield; Empire Finished Steel Corp. on allocation outside New England, Buffalo c.f. base plus c/l freight Buffalo to plants f.o.b. plant; Compressed Steel Shafting Co. on allocation outside New England, Buffalo base plus c/l freight Buffalo to Readville, Mass. f.o.b. Readville; Medart Co. in certain areas, Chicago c.f. base plus c/l freight Chicago to St. Louis, f.o.b. St. Louis.

Alloy Bars—Texas Steel Co. for delivery except Texas and Okla. Chicago base, f.o.b. Fort Worth, Tex.; Connors Steel Co. shipped outside Ala., Mississippi, Louisiana, Georgia, Florida, Tenn., Pittsburgh base, f.o.b. Birmingham.

Hot Rolled Strip—Joslyn Mfg. & Supply Co. $2.30 Chicago; Knoxville Iron Co. $2.25 basing pts.

Hot Rolled Sheets—Andrews Steel Co., Middletown base on shipments to Detroit or area; Parkersburg Iron & Steel Co., $2.25 Parkersburg.

Galvanized Sheets—Andrews Steel Co., $3.75 basing pts.; Parkersburg Iron & Steel Co. $3.85 Parkersburg; Apollo Steel Co. $3.75 basing pts.; Continental Steel Co., $3.75 basing pts.; Continental Steel Co., Middletown base on Kokomo, Ind., product; Superior Sheet Steel Co., Pittsburgh base except for Lend-Lease.

Pipe and Tubing—South Chester Tube Co. when priced at Pittsburgh, freight to Gulf Coast and Pacific Ports may be charged from Chester, Pa., also to points lying west of Harrisburg, Pa.

Black Sheets—Empire Sheet and Tinplate Co., maximum base price mill at $2.45 per 100 lb., with differentials, transportation charges, etc., provided in RPS. No. 6.

Are you ready to come up bouncing?

Your future competitive position will largely depend on your flexibility. Will you be light on your feet and ready for conversion—or will you be penalized by heavy, awkward surpluses of useless stock?

One way to beat the excess inventory problem is to buy more of your present steel requirements from warehouse. By buying only what you need for immediate production, you avoid leftovers and dead stock when cancellations, cutbacks or design changes occur. Frasse stocks of cold finished bars, tubing, stainless steel, alloy, and aircraft steels and tubing are now in good shape. By ordering from Frasse as you go, there's no surplus bogey to fear on cancellation day.

Why hamper your future operations with heavy, unwieldy surpluses that can be prevented? Start reducing yours today by using Frasse steel inventories instead.

Frasse MECHANICAL AND AIRCRAFT STEELS

SEAMLESS MECHANICAL AND AIRCRAFT TUBING • COLD FINISHED BARS • ALLOY STEELS
AIRCRAFT STEELS • DRILL ROD • STAINLESS STEELS AND TUBING • COLD ROLLED STRIP AND SHEETS • WELDED STEEL TUBING

Peter A. Frasse & Co., Inc. 17 Grand Street, New York 13, N. Y. (Walker 5-2200) • 3911 Wissahickon Avenue, Phila. 29, Pa. (Radcliff 7100–Park 5541)
50 Exchange Street, Buffalo 3, New York (Washington 2000) • Jersey City, N. J. • Hartford, Conn. • Rochester, N. Y. • Syracuse, N. Y.

WAREHOUSE PRICES

Delivered metropolitan areas per 100 lb. These are zoned warehouse prices in conformance with latest zoning amendments to OPA Price Schedule 49.

Cities	SHEETS			STRIP		Plates ¼ in. and heavier	Structural Shapes	BARS		ALLOY BARS			
	Hot Rolled (10 gage)	Cold Rolled	Galvanized (24 gage)	Hot Rolled	Cold Rolled			Hot Rolled	Cold Finished	Hot Rolled, NE 8617-20	Hot Rolled, NE 9442-45 Ann.	Cold Drawn, NE 8617-20	Cold Drawn, NE 9442-48 Ann.
**Philadelphia	3.518	4.872[6]	5.018[a]	3.922	4.772	3.605	3.668	3.822	4.072	5.966	7.066	7.272	8.322
New York	3.590	4.613[3]	5.010	3.974[6]	4.772	3.768	3.758	3.853	4.103	6.008	7.108	7.303	8.353
Boston	3.744	4.744[9]	5.224[9]	4.106	4.715	3.912	3.912	4.044	4.144	6.162	7.262	7.344	8.394
Baltimore	3.394	4.852	4.894	3.902	4.752	3.594	3.759	3.802	4.052	....	....	....	....
Norfolk	3.771	4.965	5.371	4.165	4.865	3.971	4.002	4.065	4.165	....	....	....	....
Chicago	3.25	4.20	5.231	3.60	4.65[17]	3.55	3.55	3.50	3.75	5.75	6.85	6.85	7.90
Milwaukee	3.387	4.337[3]	5.272[4]	3.737	4.787[17]	3.687	3.687	3.637	3.887	5.987	7.087	7.087	8.137
Cleveland	3.35	4.40	4.877[4]	3.60	4.45	3.40	3.588	3.35	3.75	5.956	7.056	6.85	7.90
Buffalo	3.35	4.40	4.75[4]	3.819	4.669	3.63	3.40	3.35	3.75	5.75	6.85	6.85	7.90
Detroit	3.45	4.50	5.00[4]	3.70	4.659[17]	3.609	3.661	3.45	3.80	6.08	7.18	7.159	8.209
Cincinnati	3.425	4.475[3]	4.825[5]	3.675	4.711	3.611	3.691	3.611	4.011	....	....	....	....
St. Louis	3.397	4.347[3]	5.172[4]	3.747	4.931[17]	3.697	3.697	3.647	4.031	6.131	7.231	7.231	8.281
Pittsburgh	3.35	4.40	4.75	3.60	4.45	3.40	3.40	3.35	3.75	5.75	6.85	6.85	7.90
St. Paul	3.51	4.46	5.257[4]	3.86	4.35[17]	3.811[3]	3.811[3]	3.761[3]	4.361	6.09	7.19	7.561	8.711
Omaha	3.865	5.443	5.608[4]	4.215	....	4.165	4.165	4.115	4.43	....	....	....	....
Indianapolis	3.58	3.58	4.568	4.918	3.768	4.78	3.63	3.58	3.98	6.08	7.18	7.18	8.23
Birmingham	3.45	....	4.75	3.70	....	3.55	3.55	3.50	4.43	....	....	....	....
Memphis	3.965[7]	4.66	3.265	4.215	....	4.065	4.065	4.015	4.33	....	....	....	....
New Orleans	4.058*	4.95	5.358	4.308	....	4.158	4.158*	4.108*	4.629	....	....	....	....
Houston	3.763	5.573	6.313[1]	4.313	....	4.25	4.25	3.75	6.373[3]	7.223	8.323	8.323	9.373
Los Angeles	5.00	7.20[3]	6.10[4]	4.95	5.613[15]	4.95	4.65	4.40	5.583	8.304	9.404	9.404	10.454
San Francisco	4.55[14]	7.30[4]	6.35[4]	4.50[14]	7.333[17]	4.65[14]	4.35[14]	4.15[14]	5.333	8.304	9.404	9.404	10.454
Seattle	4.65[12]	7.05[4]	5.95[4]	4.25[12]	....	4.75[12]	4.45[12]	4.35[12]	5.783	....	9.404	....	....
Portland	4.65[11]	6.60[4]	5.75[4]	4.75[11]	....	4.75[11]	4.45[11]	4.45[11]	5.533	8.304	9.404	8.304	9.404
Salt Lake City	4.53[17]	....	6.17[18]	5.53[17]	....	4.98[17]	4.98[17]	4.88[17]	5.90	....	....	....	....

NATIONAL EMERGENCY (N. E.) STEELS
(Hot Rolled Mill Extras for Alloy Content)

Designation	CHEMICAL COMPOSITION LIMITS, PER CENT								Basic Open-Hearth		Electric Furnace	
	Carbon	Manganese	Phosphorus Max.	Sulphur Max.	Silicon	Chromium	Nickel	Molybdenum	Bars and Bar-Strip	Billets, Blooms and Slabs	Bars and Bar-Strip	Billets, Blooms and Slabs
NE 1330	.28/ .33	1.60/1.90	.040	.040	.20/ .35	.....	.....	.....	.10c	$2.00	.....	.....
NE 1335	.33/ .38	1.60/1.90	.040	.040	.20/ .35	.....	.....	.....	.10	2.00	.....	.....
NE 1340	.38/ .43	1.60/1.90	.040	.040	.20/ .35	.....	.....	.....	.10	2.00	.....	.....
NE 1345	.43/ .48	1.60/1.90	.040	.040	.20/ .35	.....	.....	.....	.10	2.00	.....	.....
NE 1350	.48/ .53	1.60/1.90	.040	.040	.20/ .35	.....	.....	.....	.10	2.00	.....	.....
NE 8613	.12/ .17	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25[c]	$25.00
NE 8615	.13/ .18	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8617	.15/ .20	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8620	.18/ .23	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8630	.28/ .33	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8635	.33/ .38	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8637	.35/ .40	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8640	.38/ .43	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8642	.40/ .45	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8645	.43/ .48	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8650	.48/ .53	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8720	.18/ .23	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40 .70	.20/ .30	.80	16.00	1.30	26.00
NE 9255	.50/ .60	.70/ .95	.040	.040	1.80/2.20	.....	.....	.....	.40	8.00	.....	.....
NE 9260	.55/ .65	.70/1.00	.040	.040	1.80/2.20	.....	.....	.....	.40	8.00	.....	.....
NE 9261	.55/ .65	.70/1.00	.040	.040	1.80/2.20	.10/ .25	.....	.....	.65	13.00	.....	.....
NE 9262	.55/ .65	.70/1.00	.040	.040	1.80/2.20	.25/ .40	.....	.....	.65	13.00	.....	.....
NE 9415	.13/ .18	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9420	.18/ .23	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9422	.20/ .25	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9425	.23/ .28	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9430	.28/ .33	.90/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9435	.33/ .38	.90/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9437	.35/ .40	.90/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9440	.38/ .43	.90/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9442	.40/ .45	1.00/1.30	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.80	16.00	1.30	26.00
NE 9445	.43/ .48	1.00/1.30	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.80	16.00	1.30	26.00
NE 9450	.48/ .53	1.20/1.50	.040	.040	.20/ .35	.30/ 50	.30/ .60	.08/ .15	.80	16.00	1.30	26.00
NE 9637*	.35/ .40	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9540*	.38/ .43	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9542*	.40/ .45	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9545*	.43/ .48	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9550*	.48/ .53	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00

*Recommended for large sections only. Note: The extras shown are in addition to a base price of 2.70c. per 100 lb., on finished products and $54 per gross ton on semi-finished steel major basing points and are in cents per 100 lb. and dollars per gross ton in semi-finished. When acid open-hearth is specified and acceptable add to basic open hearth alloy differential 0.25c. per lb. for bars and bar strip, $5.00 per gross ton for billets, blooms and slabs. The ranges shown above are restricted to sizes 100 sq. in. or less or equivalent cross sectional area 18 in. wide or under with a max. individual piece weight of 7000 lb.

Base Quantities

Standard unless otherwise keyed on prices.

HOT ROLLED: Sheets, strip, plates, shapes and bars, 400 to 1999 lb.

COLD ROLLED: Sheets, 400 to 1499 lb.; strip, extras on all quantities; bars, 1500 lb. base; NE alloy bars, 1000 to 39,999 lb.

EXCEPTIONS: (1) 150 to 499 lb. (2) 150 to 1499 lb. (3) 400 to 1499 lb. (4) 450 to 1499 lb. (5) 500 to 1499 lb. (6) 0 to 1999 lb. (7) 400 to 1999 lb. (8) 1000 to 1999 lb. (9) 450 to 3749 lb. (10) 400 to 3999 lb. (11) 300 to 4999 lb. (12) 300 to 10,000 lb. (13) 400 to 14,999 lb. (14) 400 lb. and over. (15) 1000 lb. and over. (16) 1500 lb. and over. (17) 2000 lb. and over. (18) 3500 lb. and over.

(a) Philadelphia: Galvanized sheets, 25 or more bundles.

Extra for size, quality, etc., apply on above quotations.

*Add 0.271c. for sizes not rolled in Birmingham.

**City of Philadelphia only. Applicable freight rates must be added to basing point prices to obtain delivered price to other localities in metropolitan area.

LAKE SUPERIOR ORES

(51.50% *Fe, Natural Content, Delivered Lower Lake Ports)**

	Per Gross Ton
Old range, bessemer, 51.50	$4.71
Old range, non-bessemer, 51.50	4.60
Mesaba, bessemer, 51.50	4.60
Mesaba, non-bessemer, 51.50	4.45
High phosphorus, 51.50	4.35

*Adjustments are made to indicate prices based on variance of Fe content of ores as analyzed on a dry basis by independent laboratories.

FLUORSPAR

Maximum price f.o.b. consumer's plant, $30 per short ton plus either (1) rail freight from producer to consumer, or (2) rail freight from Rosiclare, Ill., to consumer, whichever is lower.

Exception

When the WPB Steel Division certifies in writing the consumer's need for one of the higher grades of metallurgical fluorspar specified in the table below the price shall be taken from the table plus items (1 and 2) from paragraph above.

Effective CaF_2 Content:	*Base price per short ton*
70% or more	$33.00
65% but less than 70%	32.00
60% but less than 65%	31.00
Less than 60%	30.00

PRICES

SEMI-FINISHED STEEL

Ingots, Carbon, Rerolling

Base per gross ton, f.o.b. mill.... $34.00
Exceptions: Phoenix Iron Co. may charge $38.75; Kaiser Co., $43.00 f.o.b. Pacific Coast Ports; Empire Sheet & Tinplate Co., $34.25.

Ingots, Carbon, Forging

Base per gross ton, f.o.b. Birmingham, Buffalo, Chicago, Cleveland, Gary, Pittsburgh, Youngstown $36.00
Exceptions: Phoenix Iron Co. may charge $43.00; Empire Sheet & Tinplate Co., $39.25, f.o.b. Mansfield, Ohio; West Coast producers, $48.00, f.o.b. Pacific Coast Ports.

Ingots, Alloy

Base per gross ton, f.o.b. Bethlehem, Buffalo, Canton, Coatesville, Chicago, Massillon, Pittsburgh $45.00
Exceptions: C/L delivered Detroit add $2.00; delivered East Michigan add $3.00. Connors Steel Co. may charge $45.00 f.o.b. Birmingham.

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (rerolling only). Prices delivered Detroit are $2.00 higher; delivered E. Michigan, $3 higher; f.o.b. Duluth, billets only, $2.00 higher; billets f.o.b. Pacific ports are $12 higher. Delivered prices do not reflect three per cent tax on freight rates.

	Per Gross Ton
Rerolling	$34.00
Forging quality	40.00

For exceptions on semi-finished steel see the footnote on the page of finished steel prices.

Alloy Billets, Blooms, Slabs

Pittsburgh, Chicago, Canton, Massillon, Buffalo, or Bethlehem, per gross ton 54.00
Price delivered Detroit $2.00 higher; E. Michigan $3.00 higher.

Shell Steel

	Per Gross Ton
3 in. to 12 in.	$52.00
12 in. to 18 in.	54.00
18 in. and over	56.00

Basic open hearth shell steel, f.o.b. Pittsburgh, Chicago, Buffalo, Gary, Cleveland, Youngstown and Birmingham.
Prices delivered Detroit are $2.00 higher; E. Michigan, $3 higher.
Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting, or quantity.

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point.

	Per Gross Ton
Open hearth or bessemer	$34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c.

Wire Rods

(*No. 5 to 9/32 in.*)

	Per Lb.
Pittsburgh, Chicago, Cleveland	2.00c.
Worcester, Mass.	2.10c.
Birmingham	2.00c.
San Francisco	2.50c.
Galveston	2.25c.

9/32 in. to 47/64 in., 0.15c. a lb. higher. Quantity extras apply.

TOOL STEEL

(*F.o.b. Pittsburgh, Bethlehem, Syracuse*)

	Base per lb.
High speed	67c.
Straight molybdenum	54c.
Tungsten-molybdenum	57½c.
High-carbon-chromium	43c.
Oil hardening	24c.
Special carbon	22c.
Extra carbon	18c.
Regular carbon	14c.

Warehouse prices east of Mississippi are 2c. a lb. higher; west of Mississippi 1c. higher.

WELDED PIPE AND TUBING

Base Discounts, f.o.b. Pittsburgh Distri and Lorain, Ohio, Mills

(F.o.b. Pittsburgh only on wrought pipe Base Price—$200 per Net Ton

	Black	Gal
Steel (Butt Weld)		
⅛ in.	63½	51
¼ in.	66½	55
⅜ to 3 in.	68½	57½
Wrought Iron (Butt Weld)		
⅛ in.	24	3½
¼ in.	30	10
⅜ and 1¼ in.	34	16
1½ in.	38	18½
2 in.	37½	18
Steel (Lap Weld)		
2 in.	61	49½
2½ and 3 in.	64	52½
3½ to 6 in.	66	54½
Wrought Iron (Lap Weld)		
2 in.	30½	12
2½ to 3½ in.	31½	14½
4 in.	33½	18
4½ to 8 in.	32½	17
Steel (Butt, extra strong, plain ends)		
⅛ in.	61½	50½
¼ in.	65½	54½
⅜ to 3 in.	67	57
Wrought Iron (Same as Above)		
⅛ in.	25	6
¼ in.	31	12
⅜ to 2 in.	38	19½
Steel (Lap, extra strong, plain ends)		
2 in.	59	48½
2½ and 3 in.	63	52½
3½ to 6 in.	66½	56
Wrought Iron (Same as Above)		
2 in.	33½	15½
2½ to 4 in.	39	22½
4½ to 6 in.	37½	21

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or $2 a ton higher on all butt weld.

CAST IRON WATER PIPE

Per Net Ton

6-in. and larger, del'd Chicago.... $54.10
6-in. and larger, del'd New York... 52.10
6-in. and larger, Birmingham 46.00
6-in. and larger f.o.b. cars, San Francisco or Los Angeles 69.40
6-in. and larger f.o.b. cars, Seattle. 71.20

Class "A" and gas pipe, $3 extra; 4-in. pipe is $3 a ton above 6-in. Prices shown are for lots of less than 200 tons. For 200 tons or over, 6-in. and larger is $46 at Birmingham and $53.80 delivered Chicago, $59.40 at San Francisco and Los Angeles, and $70.20 at Seattle. Delivered prices do not reflect new 3 per cent tax on freight rates.

BOILER TUBES

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes, Minimum Wall. Net base prices per 100 ft. f.o.b. Pittsburgh, in carload lots.

	Seamless Cold Drawn	Seamless Hot Rolled	Lap Weld, Hot Rolled
2 in. o.d. 13 B.W.G.	15.03	13.04	12.33
2½ in. o.d. 12 B.W.G.	20.21	17.54	16.58
3 in. o.d. 12 B.W.G.	22.48	19.50	18.38
3½ in. o.d. 11 B.W.G.	28.37	24.62	23.15
4 in. o.d. 10 B.W.G.	35.20	30.54	28.66

(Extras for less carload quantities)

40,000 lb. or ft., and over	Base
30,000 lb. or ft. to 39,999 lb. or ft.	5%
20,000 lb. or ft. to 29,999 lb. or ft.	10%
10,000 lb. or ft. to 19,999 lb. or ft.	20%
5,000 lb. or ft. to 9,999 lb. or ft.	30%
2,000 lb. or ft. to 4,999 lb. or ft.	45%
Under 2,000 lb. or ft.	65%

PRICES

WIRE PRODUCTS

To the trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham, Duluth

	Basing Points Named	Pacific Coast Basing Points†
	Base per Keg	
Standard wire nails	$2.55	$3.05
Coated nails	2.55	3.05
Cut nails, carloads	3.85	....
	Base per 100 Lb.	
Annealed fence wire	$3.05	$3.55
Annealed galv. fence wire	3.40	3.90
	Base Column	
Woven wire fence*	$0.67	$0.85
Fence posts, carloads	.69	.86
Single loop bale ties	.59	.84
Galvanized barbed wire**	.70	.80
Twisted barbless wire	.70	....

*15½ gage and heavier. **On 80-rod spools in carload quantities.
†Prices subject to switching or transportation charges.

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts
(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Machine and Carriage Bolts:
Base discount less case lots

	Per Cent Off List
⅛ in. & smaller x 6 in. & shorter	65½
9/16 & ⅝ in. x 6 in. & shorter	63½
¾ to 1 in. x 6 in. & shorter	61
1⅛ in. and larger, all lengths	59
All diameters over 6 in. long	59
Lag, all sizes	62
Plow bolts	65

Nuts, Cold Punched or Hot Pressed:
(Hexagon or Square)

⅛ in. and smaller	62
9/16 to 1 in. inclusive	59
1⅛ to 1½ in. inclusive	57
1⅝ in. and larger	56

On above bolts and nuts, excepting plow bolts, additional allowance of 10 per cent for full container quantities. There is an additional 5 per cent allowance for carload shipments.

Semi-Fin. Hexagon Nuts	U.S.S.	S.A.E.
Base discount less keg lots		
7/16 in. and smaller	..	64
⅛ in. and smaller	62	..
⅛ in. through 1 in.	..	60
9/16 in. to 1 in.	59	..
1⅛ in. through 1½ in.	57	58
1⅝ in. and larger	56	..

In full keg lots, 10 per cent additional discount.

Stove Bolts

	Consumer
Packages, nuts loose	71 and 10
In packages, with nuts attached	71
In bulk	80

On stove bolts freight allowed up to 65c. per 100 lb. based on Cleveland Chicago, New York on lots of 200 lb. or over.

Large Rivets
(½ in. and larger)

	Base per 100 lb.
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	$3.75

Small Rivets
(7/16 in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh, Cleveland Chicago, Birmingham	65 and 5

Cap and Set Screws

	Consumer Per Cent Off List
Upset full fin. hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in.	64
Upset set screws, cup and oval points	71
Milled studs	46
Flat head cap screws, listed sizes	36
Fillister head cap, listed sizes	51

Freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.

ROOFING TERNE PLATE

(F.o.b. Pittsburgh, 112 Sheets)

	20x14 in.	20x28 in.
8-lb. coating I.C.	$6.00	$12.00
15-lb. coating I.C.	7.00	14.00
30-lb. coating I.C.	7.50	15.00

PIG IRON

All prices set in bold face type are maxima established by OPA on June 24, 1941. Other domestic prices (in italics) are delivered quotations per gross ton computed on the basis of the official maxima. Delivered prices do not reflect 3 per cent tax on freight rates.

	No. 2 Foundry	Basic	Bessemer	Malleable	Low Phosphorus	Charcoal
Boston	*$25.50*	*$25.00*	*$26.50*	*$26.00*	.....	.....
Brooklyn	*27.50*	*27.00*	.....	*28.00*	.....	.....
Jersey City	*26.53*	*26.03*	*27.53*	*27.03*	.....	.....
Philadelphia (4)	*25.84*	*25.34*	*26.84*	*26.34*	*$30.74*	.....
Bethlehem, Pa.	25.00	24.50	26.00	25.50	.....	.....
Everett, Mass.	25.00	24.50	26.00	25.50	.....	.....
Swedeland, Pa.	25.00	24.50	26.00	25.50	.....	.....
Steelton, Pa.	.....	24.50	.....	.....	29.50	.....
Birdsboro, Pa. (3)	25.00	24.50	26.00	25.50	29.50	.....
Sparrows Point, Md.	25.00	24.50	.....	.....	.....	.....
Erie, Pa.	24.00	23.50	25.00	24.50	.....	.....
Neville Island, Pa.	24.00	23.50	24.50	24.00	.....	.....
Sharpsville, Pa. (1)	24.00	23.50	24.50	24.00	.....	.....
Buffalo	24.00	23.50	25.00	24.50	29.50	.....
Cincinnati, Ohio	*25.11*	*24.61*	.....	*25.11*	.....	.....
Canton, Ohio	*25.39*	*24.89*	*25.89*	*25.39*	*32.69*	.....
Mansfield, Ohio	*25.94*	*25.44*	*26.44*	*25.94*	*32.86*	.....
St. Louis	*24.50*	*24.50*	.....	.....	.....	.....
Chicago	24.00	23.50	24.50	24.00	*35.46*	.... *$37.34*
Granite City, Ill.	24.00	23.50	24.50	24.00	.....	.....
Cleveland	24.00	23.50	24.50	24.00	*32.42*	.....
Hamilton, Ohio	24.00	23.50	.....	24.00	.....	.....
Toledo	24.00	23.50	24.50	24.00	.....	.....
Youngstown	24.00	23.50	24.50	24.00	*32.42*	.....
Detroit	24.00	23.50	24.50	24.00	.....	.....
Lake Superior fc.	.....	.....	.....	.....	.....	34.00
Lyles, Tenn. fc. (2)	.....	.....	.....	.....	.....	33.00
St. Paul	*26.63*	26.13	*27.13*	*26.63*	*39.80*	.....
Duluth	24.50	24.00	25.00	24.50	....	.....
Birmingham	20.38	19.00	25.00	.....	.....	.....
Los Angeles	*26.95*	....	.....	.....	.....	...
San Francisco	*26.95*	.....	.....	.....	.....	.....
Seattle	*26.95*	.....	.....	.....	.....	.....
Provo, Utah	22.00	21.50	.....	.....	.....	.....
Montreal	*27.50*	*27.50*	...	*28.00*	.....	.....
Toronto	*25.50*	*25.50*	...	*26.00*	.....	.....

GRAY FORGE IRON: Valley or Pittsburgh furnace $23.50

(1) Pittsburgh Coke & Iron Co. (Sharpsville, Pa., furnace only) and the Struthers Iron and Steel Co., Struthers, Ohio, may charge 50c. a ton in excess of basing point prices for No. 2 foundry, basic, bessemer and malleable. Struthers Iron and Steel Co. may add another $1.00 per gross ton for iron from Struthers, Ohio, plant.

(2) Price shown is for low-phosphorous iron; high phosphorous sells for $28.50 at the furnace.

(3) E. & G. Brooke Co. Birdsboro, Pa., permitted to charge $1.00 per ton extra.

(4) Pittsburgh Ferromanganese Co. (Chester furnace only) may charge $2.25 a ton over maximum basing point prices.

Basing point prices are subject to switching charges; Silicon differentials (not to exceed 50c. a ton for each 0.25 per cent silicon content in excess of base grade which is 1.75 to 2.25 per cent); Phosphorus differentials, a reduction of 38c. per ton for phosphorus content of 0.70 per cent and over; Manganese differentials, a charge not to exceed 50c. per ton for each 0.50 per cent manganese content in excess of 1.00 per cent. Effective March 3, 1943, $2 per ton extra may be charged for 0.5 to 0.75 per cent nickel content and $1 per ton extra for each additional 0.25 per cent nickel.

METAL POWDERS

Prices are based on current market prices of ingots plus a fixed figure. F.o.b. shipping point, c. per lb., ton lots.

Copper, electrolytic, 150 and 200 mesh	21⅛ to 23½c.
Copper, reduced, 150 and 200 mesh	20½ to 25½c.
Iron, commercial, 100 and 200 mesh, 96 + % Fe	13½ to 15c.
Iron, crushed, 200 mesh and finer, 90 + % Fe	4c.
Iron, hydrogen reduced, 300 mesh and finer, 98½ + % Fe	63c.
Iron, electrolytic, unannealed, 300 mesh and coarser, 99 + % Fe	30 to 33c.
Iron, electrolytic, annealed minus 100 mesh, 99 + % Fe	42c.
Iron, carbonyl, 300 mesh and finer, 98-99.8 + % Fe	90c.
Aluminum, 100 and 200 mesh	*23 to 27c.
Antimony, 100 mesh	20.6c.
Cadmium, 100 mesh	$1
Chromium, 150 mesh	$1.03
Lead, 100, 200 & 300 mesh, 11½ to 12½c.	
Manganese, 150 mesh	51c.
Nickel, 150 mesh	51½c.
Solder powder, 100 mesh, 8½c. plus metal	
Tin, 100 mesh	58¾c.
Tungsten metal powder, 98%-99%, any quantity, per lb.	$2.60
Molybdenum power, 99%, in 200-lb. kegs, f.o.b. York, Pa., per lb.	$2.60
Under 100 lb.	$3.00

*Freight allowed east of Mississippi.

COKE

	Net Ton
Furnace, beehive (f.o.b. oven)	
Connellsville, Pa.	$7.00*
Foundry, beehive (f.o.b. oven)	
Fayette Co., W. Va.	8.10
Connellsville, Pa.	8.25
Foundry, By-Product	
Chicago, del'd	13.35
Chicago, f.o.b.	12.60
New England, del'd	14.25
Kearny, N. J., f.o.b.	12.65
Philadelphia, del'd	12.88
Buffalo, del'd	13.00
Portsmouth, Ohio, f.o.b.	11.10
Painesville, Ohio, f.o.b.	11.75
Erie, del'd	12.75
Cleveland, del'd	12.80
Cincinnati, del'd	12.85
St. Louis, del'd	13.85
Birmingham, del'd	10.50

*Hand drawn ovens using trucked coal permitted to charge $7.75 per ton plus transportation charges. **Mo., Ala., and Tenn. producers—$13.35.

NEWS OF INDUSTRY

REFRACTORIES
(F.o.b. Works)

	Per 1000
Fire Clay Brick	
Super-duty brick, St. Louis	$64.60
First quality, Pa., Md., Ky., Mo., Ill.	51.30
First quality, New Jersey	56.00
Sec. quality, Pa., Md., Ky., Mo., Ill.	46.55
Second quality, New Jersey	51.00
No. 1, Ohio	43.00
Ground fire clay, net ton	7.60
Silica Brick	
Pennsylvania and Birmingham	$51.30
Chicago District	58.90
Silica cement, net ton (Eastern)	9.00
	Per Net Ton
Chrome Brick	
Standard chemically bonded, Balt., Plymouth Meeting, Chester	$54.00
Magnesite Brick	
Standard, Balt. and Chester	$76.00
Chemically bonded, Baltimore	65.00
Grain Magnesite	
Domestic, f.o.b. Balt. and Chester in sacks (carloads)	$43.48
Domestic, f.o.b. Chewelah, Wash. (in bulk)	22.00

RAILS, TRACK SUPPLIES
(F.o.b. Mill)

Standard rails, heavier than 60 lb., No. 1 O.H., gross ton	$40.00
Angle splice bars, 100 lb.	2.70
(F.o.b. Basing Points)	*Per Gross Ton*
Light rails (from billets)	$40.00
Light rails (from rail steel)	39.00
	Base per l.b.
Cut spikes	3.00c.
Screw spikes	5.15c.
Tie plates, steel	2.15c.
Tie plates, Pacific Coast	2.30c.
Track bolts	4.75c.
Track bolts, heat treated, to railroads	5.00c.
Track bolts, jobbers discount	63-5

Basing points, light rails, Pittsburgh, Chicago, Birmingham; cut spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo. Cut spikes alone—Youngstown, Lebanon, Pa., Richmond, Oregon and Washington ports, add 25c.

CORROSION AND HEAT-RESISTING STEEL
(Per lb. base price, f.o.b. Pittsburgh)

Chromium-Nickel Alloys

	No. 304	No. 302
Forging billets	21.25c.	20.40c.
Bars	25.00c.	24.00c.
Plates	29.00c.	27.00c.
Structural shapes	25.00c.	24.00c.
Sheets	36.00c.	34.00c.
Hot rolled strip	23.50c.	21.50c.
Cold rolled strip	30.00c.	28.00c.
Drawn wire	25.00c.	24.00c.

Straight-Chromium Alloys

	No. 410	No. 430	No. 442	No. 446
F.Billets	15.725c.	16.15c.	19.125c.	23.375c.
Bars	18.50c.	19.00c.	22.50c.	27.50c.
Plates	21.50c.	22.00c.	25.50c.	30.50c.
Sheets	26.50c.	29.00c.	32.50c.	36.50c.
Hot strip	17.00c.	17.50c.	24.00c.	35.00c.
Cold strip	22.00c.	22.50c.	32.00c.	52.00c.

Chromium-Nickel Clad Steel (20%)

	No. 304
Plates	18.00c.*
Sheets	19.00c.

*Includes annealing and pickling.

ELECTRICAL SHEETS
(Base, f.o.b. Pittsburgh)

	Per Lb.
Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
Motor	4.95c.
Dynamo	5.65c.
Transformer 72	6.15c.
Transformer 65	7.15c.
Transformer 58	7.65c.
Transformer 52	8.45c.

F.o.b. Granite City, add 10c. per 100 lb. on field grade to and including dynamo. Pacific ports add 75c. per 100 lb. on all grades.

PRICES

Ferromanganese

78-82% Mn, maximum contract b
price per gross ton, lump size, f.o.b.
at Baltimore, Bethlehem, Philadelp
New York, Birmingham, Rockdale, R
wood, Tenn.

Carload lots (bulk)	$13
Carload lots (packed)	14
Less ton lots (packed)	14

Premium, $1.70 for each 1% above
Mn; penalty, $1.70 for each 1% be
78%.

Manganese Metal

Contract basis, lump size, per lb.
metal, f.o.b. shipping point with fre
allowed. Spot sales add 2c. per lb.

96-98% Mn, .2% max. C, 1% max
2% max. Fe.

Carload, bulk	
L.c.l. lots	

95-97% Mn, .2% max. C, 1.5% max
2.5% max. fe.

Carload, bulk	
L.c.l. lots	

Spiegeleisen

Maximum base, contract prices,
gross ton, lump, f.o.b. Palmerton, Pa.

	16-19% Mn	19-21% M
	3% max. Si	3% max. S
Carloads	$35.00	$36.00
Less ton	47.50	48.50

Electric Ferrosilicon

OPA maximum base price cents per
contained Si, lump size in carlots, f.
shipping point with freight allowed
destination.

	Eastern Zone	Central Zone	West Zo
50% Si	6.65c.	7.10c.	7.2
75% Si	8.05c.	8.20c.	8.3
80-90% Si	8.90c.	9.05c.	9.2
90-95% Si	11.05c.	11.20c.	11.3

Spot sales add: .45c. per lb. for 5
Si, .3c. per lb. for 75% Si, .25c. per
for 80-90% and 90-95% Si.

Silvery Iron

(*Per Gross Ton, base* 6.00 *to* 6.50 Si)

F.o.b. Jackson, Ohio	$23.
Buffalo	30.

For each additional 0.50% silicon a
$1 a ton. For each 0.50% manga
over 1% add 50c. a ton. Add $1 a t
for 0.75% phosphorous or over.

*OPA price established 6-24-41.

Bessemer Ferrosilicon

Prices are $1 a ton above silvery i
quotations of comparable analysis.

Silicon Metal

OPA maximum base price per lb.
contained Si, lump size, f.o.b. shipp
point with freight allowed to destinati
for l.c.l. above 2000 lb., packed. Add .5
for spot sales.

	Eastern Zone	Central Zone	West Zo
96% Si, 2% Fe.	13.10c.	13.55c.	16.7
97% Si, 1% Fe.	13.45c.	13.90c.	16.9

Ferrosilicon Briquets

OPA maximum base price per lb.
briquet, bulk, f.o.b. shipping point w
freight allowed to destination. Appro
mately 40% Si. Add .25c. for spot sa

	Eastern Zone	Central Zone	West Zo
Carload, bulk	3.35c.	3.50c.	3.65
2000 lb.-carload	3.8c.	4.2c.	4.35

Silicomanganese

Contract basis lump size, per lb.
metal, f.o.b. shipping point with frei
allowed. Add .25c. for spot sales. 65-7
Mn, 17-20% Si, 1.5% max. C.

Carload, bulk	6.
2000 lb. to carload	6.
Under 2000 lb.	6.
Briquets, contract, basis carlots, bulk freight allowed, per lb.	5.
2000 lb. to carload	6.
Less ton lots	6.

Ferrochrome

(65-72% *Cr, 2% max. Si*)

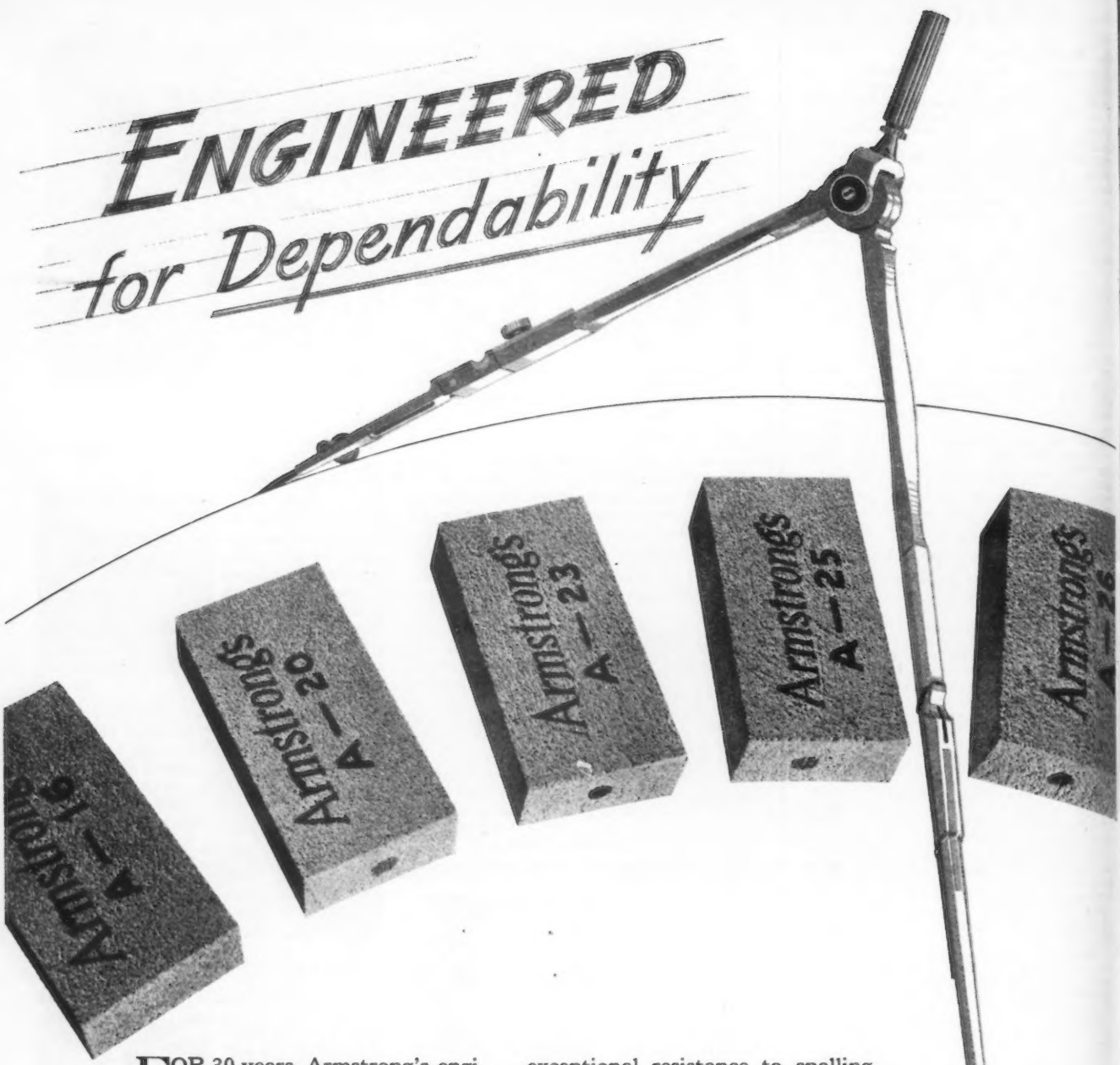
OPA maximum base contract prices p
lb. of contained Cr, lump size in carl
lots, f.o.b. shipping point, freight allow
to destination. Add .25c. per lb. c
tained Cr for spot sales.

	Eastern Zone	Central Zone	West Zo
0.06% C	23.00c.	23.40c.	24.
0.10% C	22.50c.	22.90c.	23.
0.15% C	22.00c.	22.40c.	23.
0.20% C	21.50c.	21.90c.	22.
0.50% C	21.00c.	21.40c.	22.
1.00% C	20.50c.	20.90c.	21.
2.00% C	19.50c.	19.90c.	21.
66-71% Cr, 4-10% C	13.00c.	13.40c.	14.

Other Ferroalloys

Ferrotungsten, Standard grade, lump or ¼X down, packed, f.o.b. plant at Niagara Falls, New York, Washington, Pa., York, Pa., per lb. contained tungsten. 10,000 lb. of more...	$1.90
Ferrovanadium, 35-55%, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. contained Va.	
Open Hearth	$2.70
Crucible	$2.80
Primos	$2.90
Cobalt, 97% min., keg packed, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. of cobalt metal	$1.50
Vanadium pentoxide, 88%-92% V_2O_5 technical grade, contract basis, any quantity, per lb. contained V_2O_5. Spot sales add 5c. per lb. contained V_2O_5	$1.10
Ferroboron, contract basis, 17.50% min. Bo, f.o.b. producer's plant with usual freight allowances, per lb. of alloy.	
2000 lb. to carload	$1.20
Under 2000 lb.	1.30
Silicaz No. 3, contract basis, f.o.b. producer's plant with usual freight allowances, per lb. of alloy. (Pending OPA approval)	
Carload lots	25c.
2000 lb. to carload	26c.
Silvaz No. 3, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy (Pending OPA approval)	
Carload lots	58c.
2000 lb. to carload	59c.
Grainal, f.o.b. Bridgeville, Pa., freight allowed 50 lb. and over, max. based on rate to St. Louis	
No. 1	87.5c.
No. 6	60c.
No. 79	45c.
Bortram, f.o.b. Niagara Falls	
Ton lots, per lb.	45c.
Less ton lots, per lb.	50c.
Ferrocolumbium, 50-60%, contract basis, f.o.b. plant with freight allowances, per lb contained Cb.	
2000 lb. lots	$2.25
Under 2000 lb. lots	$2.30
Ferrotitanium, 40%-45%, f.o.b. 0.10c. max. Niagara Falls, N. Y.,	
ton lots, per lb. contained Ti...	$1.23
Less ton lots	$1.25
Ferrotitanium, 20%-25%, 0.10 C max., ton lots, per lb. contained titanium	$1.35
Less ton lots	$1.40
High-carbon ferrotitanium, 15%-20%, 6%-8% carbon, contract basis, f.o.b. Niagara Falls, N. Y., freight allowed East of Mississippi River, North of Baltimore and St. Louis, per carload	$142.50
Ferrophosphorus, 18% electric or blast furnace, f.o.b. Anniston, Ala., carlots, with $3 unitage freight equaled with Rockdale, Tenn., per gross ton	$58.50
Ferrophosphorus, electrolytic 23-26%, carlots, f.o.b. Monsanto (Siglo), Tenn., $3 unitage freight equalized with Nashville, per gross ton	$75.00
Ferromolybdenum, 55-75%, f.o.b. Langeloth, Washington, Pa., any quantity, per lb. contained Mo.	95c.
Calcium molybdate, 40%-45%, f.o.b. Langeloth and Washington, Pa., any quantity, per lb. contained Mo	80c.
Molybdenum oxide briquettes, 48%-52% Mo, f.o.b. Langeloth, Pa., per lb. contained Mo	80c.
Molybdenum oxide, in cans, f.o.b. Langeloth and Washington, Pa., per lb. contained Mo	80c.
Zirconium, 35-40%, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy. Add ¼c. for spot sales	
Carload lots	14c.
Zirconium, 12-15%, contract basis, lump, f.o.b. plant usual freight allowances, per lb. of alloy	
Carload, bulk	4.6c.
Alsifer (approx. 20% Al, 40% Si and 40% Fe), contract basis, f.o.b. Niagara Falls, carload, bulk	5.75c.
Ton lots	7.25c.
Simanal (approx. 20% Si, 20% Mn, 20% Al), contract basis, f.o.b. Philo, Ohio, with freight not to exceed St. Louis rate allowed, per lb.	
Car lots	8.75c.
Ton lots	9.25c.

ENGINEERED for Dependability



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